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VOLUME 22/ NUMBER 23
DECEMBER 8, 1984
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Scientific and Technical Aerospace Reports, Volume 22, is prepared by the NASA Scientific and Technical Information Facility operated for the National Aeronautics and Space Administration by PRC Government Information Systems.

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US ISSN 0036-8741

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AERONAUTICS

Includes aeronautics (general); aerodynamics; air transportation and safety; aircraft communications and navigation; aircraft design, testing and performance; aircraft instrumentation; aircraft propulsion and power; aircraft stability and control; and research and support facilities (air).

For related information see also *Astronautics*.

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Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer*.

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Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer*

03 AIR TRANSPORTATION AND SAFETY 3691

Includes passenger and cargo air transport operations; and aircraft accidents.

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Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command and Tracking* and *32 Communications*.

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Includes aircraft simulation technology.

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Includes cockpit and cabin display devices; and flight instruments.

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07 AIRCRAFT PROPULSION AND POWER 3694

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion*.

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For related information see also *Aeronautics*

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18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE 3700

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Includes vacuum technology; control engineering; display engineering; and cryogenics.

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81 ADMINISTRATION AND MANAGEMENT **3832**
Includes management planning and research.

82 DOCUMENTATION AND INFORMATION SCIENCE 3834
Includes information storage and retrieval technology; micrography; and library science.
For computer documentation see *61 Computer Programming and Software.*

83 ECONOMICS AND COST ANALYSIS N.A.
Includes cost effectiveness studies.

84 LAW AND POLITICAL SCIENCE 3835
Includes space law; international law; international cooperation; and patent policy.

85 URBAN TECHNOLOGY AND TRANSPORTATION 3836
Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.
For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences.*

88 SPACE SCIENCES (GENERAL) 3836

89 ASTRONOMY 3838
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS 3839
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION 3841
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

92 SOLAR PHYSICS 3844
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION 3845
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

GENERAL

99 GENERAL 3845

Note: N.A. means that no abstracts were assigned to this category for this issue.

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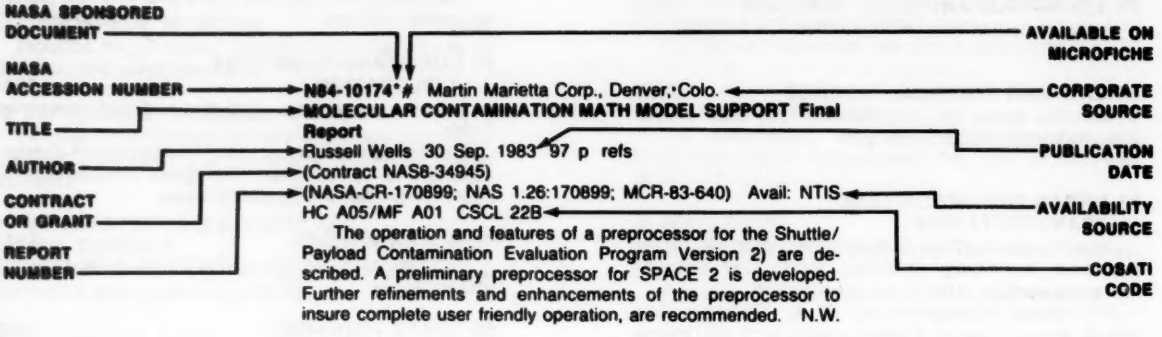
TYPICAL CITATION AND ABSTRACT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COSATI CODE
N84-10174*# Martin Marietta Corp., Denver, Colo.
MOLECULAR CONTAMINATION MATH MODEL SUPPORT Final Report
Russell Wells 30 Sep. 1983 97 p refs
(Contract NAS8-34945)
(NASA-CR-170899; NAS 1.26:170899; MCR-83-640) Avail: NTIS
HC A05/MF A01 CSCL 22B
The operation and features of a preprocessor for the Shuttle/Payload Contamination Evaluation Program Version 2) are described. A preliminary preprocessor for SPACE 2 is developed. Further refinements and enhancements of the preprocessor to insure complete user friendly operation, are recommended. N.W.

VOLUME 22 NUMBER 23 / DECEMBER 8, 1984

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

N84-33366# Naval War Coll., Newport, R. I. Dept. of Naval Operations.
AVCAL (AVIATION CONSOLIDATED ALLOWANCE) RESTORATION PROGRAM AND AIRCRAFT MATERIAL CONDITION
Benjamin H. Welch, III 22 Jun. 1984 40 p
(AD-A144045) Avail: NTIS HC A03/MF A01 CSCL 05/1

The direct relation between spare parts and aircraft material condition is intuitively obvious, but forecasting what a given finding of spare parts will produce in terms of aircraft readiness has previously been more art than science. The Aviation Consolidated Allowance (AVCAL) Restoration Program, a $2.3 billion funding of repairable spare from FY 81 to FY 89, was originated by the Aviation Supply Office (ASO) to correct present spare parts deficiencies. A thorough review of the AVCAL Restoration Program (ARP) describes the various spare parts initiatives underway, after an overview of the current aviation supply system demonstrates the value of stressing repairable spare parts deficiencies. While the ARP was coming into being, the Center for Naval Analyses (CNA) has provided the quantification of the relation between spare parts and aircraft material condition. The CNA model will be described and used to estimate the effect of the ARP. GRA

N84-33367# Societe Nationale Industrielle Aerospatiale, Paris (France). Div. Helicopteres.
CONTRIBUTION OF THE INDUSTRY TO A BETTER ADAPTATION OF HELICOPTERS TO MILITARY REQUIREMENTS [BEITRAG DER INDUSTRIE ZUR BESSEREN ANPASSUNG DES HUBSCHRAUBERS AN MILITARISCHE FORDERUNGEN]
Georges Petit 1984 23 p In GERMAN
(SNIAS-841-210-102) Avail: NTIS HC A02/MF A01

A method to determine the importance of helicopter specification parameters is explained. The problem of helicopter ability to survive in a modern fighting zone and the related consequences on the definition of a weapons systems are treated. The necessity to treat helicopters and accessories as a single integrated weapon system is explained. Author (ESA)

N84-33368# Joint Publications Research Service, Arlington, Va.
USSR REPORT: TRANSPORTATION
18 Sep. 1984 87 p refs Transl. into ENGLISH from various Russian articles
(JPRS-UTR-84-026) Avail: NTIS HC A05/MF A01

Various facets of transportation in the U.S.S.R. are discussed, including civil aviation, motor vehicles and highways, rail transportation, maritime and river shipping, fishing fleet development, and ports. For individual titles, see N84-33369 through N84-33370.

N84-33369# Joint Publications Research Service, Arlington, Va.
CIVIL AVIATION OFFICIALS REVIEW MINISTERIAL CONCERNS, GOALS
B. Panyukov *In its* USSR Rept.: Transportation (MPRS-UTR-84-026) 18 Sep. 1984 p 1-10 Transl. into ENGLISH of Vozdushnyy Transport (Moscow), 24 Jul. 1984 p 1-2 (For primary document see N84-33368 23-01)
Avail: NTIS HC A05/MF A01

Excerpts from a meeting of the Soviet Ministry of Civil Aviation are presented. The further development of civil aviation in 1985, 1986 to 1990, and the period up to 2000 was discussed. Aircraft production efficiency, air crew training, the IL-86 fleet of aircraft, and Soviet economic and social factors relating to aviation were mentioned. R.S.F.

N84-33370# Joint Publications Research Service, Arlington, Va.
AEROPROYEKT INSTITUTE'S WORK IN AVIATION FACILITY DESIGN c09
V. Ivanov *In its* USSR Rept.: Transportation (JPRS-UTR-84-026) 18 Sep. 1984 p 11-14 Transl. into ENGLISH from Vozdushnyy Transport (Moscow), 31 Jul. 1984 p 3 (For primary document see N84-33368 23-01)
Avail: NTIS HC A05/MF A01

Soviet airport facilities are discussed. Automatic systems to improve human productivity and reduce aircraft downtime are mentioned. The application of scientific and technical advances to ground support for contemporary aircraft is emphasized. R.S.F.

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N84-33371 Oklahoma State Univ., Stillwater.
TURBULENCE CHARACTERISTICS OF SWIRLING FLOWFIELDS Ph.D. Thesis
Trevor William Jackson 1983 277 p
Avail: Univ. Microfilms Order No. 22992

The time-mean and turbulence properties of a confined swirling jet using the six-orientation, single hot-wire technique were obtained. The test section was designed to conform to an idealized axisymmetric combustion, typical of those found in gas turbine and ramjet engines. Measurements of the rate of eddy dissipation were obtained by time differentiating the fluctuating velocity in the direction of the time-mean velocity vector. The measurements were performed in a confined jet with varying degrees of swirl, ranging from zero swirl strength to swirl vane angles of 70 degrees. The effect of a strong contraction nozzle placed in the flowfield at L/D = 2 is shown. In addition, the effect of the sudden expansion on the flowfield is investigated. Further, an uncertainty and directional analysis is performed on the hot-wire technique to decide its effectiveness in swirling flowfields. The effect of swirl on a confined, expanding jet is to reduce the size of the corner recirculation zone and generate a central recirculation zone followed by a precessing vortex core. Turbulence levels and shear

stresses are found to be high in and around these regions and in areas of high acceleration. The eddy dissipation rate is found to be high on the shear layers near the exit of the swirler.
Dissert. Abstr.

N84-33372 Wayne State Univ., Detroit, Mich.
A STUDY OF THE CROSS FLOW FAN Ph.D. Thesis
Joseph Stanley Mazur 1984 290 p
Avail: Univ. Microfilms Order No. DA8414515

The cross flow fan has been used for almost a century. The cross flow fan flow field is fundamentally different from that of other centrifugal fans. The flow enters and leaves the rotor along surfaces which are essentially parallel to the rotor axis. Neither a thorough understanding of the aerodynamics of the fan nor an adequate modeling procedure currently exists. Tests on a particular design of cross flow fan show that the fan housing shape has a decisive effect on fan performance. The rotor blade end conditions also have a significant effect on performance, while the blade shape and inlet and outlet angles, within limits, have only a secondary effect. Flow field measurements indicate that the throughflow region of the fan is two-dimensional, while the vortex exists within the rotor is not. Insertion of relatively small measurement probes into the flow field, particularly along the boundary between the vortex and the throughflow, modifies the flow field and reduces fan performance significantly. Dissert. Abstr.

N84-33373 Texas Univ., Austin.
PARABOLIZED NAVIER-STOKES SOLUTIONS FOR HYPERSONICFLOW FIELDS Ph.D. Thesis
Iraj Amirkabirian 1983 156 p
Avail: Univ. Microfilms Order No. DA8414340

In order to predict the aerothermodynamic environment of a vehicle in a hypersonic stream, a solution of the viscous inviscid flow field around the vehicle is required. One technique for solving a complex, hypersonic flow field is the Parabolized Navier-Stokes approach. This procedure solves the entire flow field using approximate forms of the Navier-Stokes equation. To speed the numerical solutions, the viscous terms are retained only near the body. Thus, the Euler equations are solved outside the region influenced by viscosity. Solutions obtained from the PNS technique for laminar flows have been shown to be of engineering accuracy. A numerical code developed at NASA-JSC using the PNS approach has been modified and adapted to the University's computer system. In the present investigation, the PNS equations are modified to include turbulence quantities for the calculations of the flow field around a body at zero degree angle of attack in a supersonic stream. The usual order of magnitude analysis has been used to eliminate second-order turbulence quantities. The first-order turbulence quantities are evaluated via the use of a turbulence model with the streamwise distribution of turbulent shear stress calculated from a transport equation. Dissert. Abstr.

N84-33374 Stanford Univ., Calif.
AN EXPERIMENTAL INVESTIGATION OF AN UNDER-EXPANDED RECTANGULAR JET EJECTOR Ph.D. Thesis
Yeu-Chuan Hsia 1984 125 p
Avail: Univ. Microfilms Order No. DA8412853

An experimental investigation was carried out on a rectangular ejector (constant area mixing duct) with an underexpanded rectangular jet as the primary flow. The purpose of this investigation is to study the mixing behavior of the ejector flow in general and to identify the effects of the screech tones on the mixing and performance of the ejector in particular. The quantities measured include frequency and amplitude of the screech tone, surface pressure on the ejector duct wall, and the mean flow velocity at the ejector exit in the two central planes of the primary jet. Schlieren flow visualization was made in the plane containing the short dimension of the primary nozzle. It has been found that the screech tone frequency of the ejector depends not only on the primary jet pressure ratio but also on the ejector duct width. The variations of the screech tone frequency with both the pressure ratio and the duct width show staging behavior. For a given duct width, each screech tone stage matches with one of the transverse modes of the duct. Dissert. Abstr.

N84-33375 Mississippi State Univ., Mississippi State.
A FULLY VECTORIZED NUMERICAL SOLUTION OF THE INCOMPRESSIBLE NAVIER-STOKES EQUATIONS Ph.D. Thesis
Nisheeth R. Patel 1983 178 p
Avail: Univ. Microfilms Order No. DA8413955

A vectorizable algorithm is presented for the implicit finite difference solution of the incompressible Navier-Stokes equations in general curvilinear coordinates. The unsteady Reynolds averaged Navier-Stokes equations solved are in two-dimension and non-conservative primitive variable form. A two-layer algebraic eddy viscosity turbulence model is used to incorporate the effects of turbulence. Two momentum equations and a Poisson pressure equation, which is obtained by taking the divergence of the momentum equations and satisfying the continuity equation, are solved simultaneously at each time step. An elliptic grid generation approach is used to generate a boundary-conforming coordinate system about an airfoil. The governing equations are expressed in terms of the curvilinear coordinates and are solved on a uniform rectangular computational domain. A checkerboard SOR, which can effectively utilize the computer architectural concept of vector processing, is used for iterative solution of the governing equations. Dissert. Abstr.

N84-33376 Mississippi State Univ., Mississippi State.
TRANSONIC VISCOUS-INVISCID INTERACTION USING EULER AND INVERSE BOUNDARY-LAYER EQUATIONS Ph.D. Thesis
James Lee Thomas 1983 116 p
Avail: Univ. Microfilms Order No. DA8413963

Transonic viscous-inviscid interaction is considered using Euler and inverse boundary-layer equations. The inverse boundary-layer equations are solved with a compressible, turbulent, mean-flow kinetic energy integral method. The integral method, originally developed for attached flows, is modified to account for separated flows by extensions to the velocity profile and turbulence models. Two velocity profile models are considered and each is reduced to a one-parameter family for separated flows by means of correlation with experimental data. A satisfactory description of turbulent velocity profiles can be obtained with either model. An approximate lag equation for the dissipation is developed. Prescribed displacement thickness (non-interacting) computations with the integral method are compared with experimental results for a low-speed separation diffuser and several normal shock-wave boundary-layer interactions. The Euler equations are used to represent the inviscid flow and are solved with a conservative, finite-volume, Runge-Kutta time-stepping scheme. Modifications are made to account for wall porosity boundary conditions.
Dissert. Abstr.

N84-33377*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AERODYNAMIC DESIGN OF THE CONTOURED WIND-TUNNEL LINER FOR THE NASA SUPERCRITICAL, LAMINAR-FLOW-CONTROL, SWEPT-WING EXPERIMENT
Perry A. Newman, E. Clay Anderson, and John B. Peterson, Jr. Sep. 1984 46 p refs
(NASA-TP-2335; L-15521; NAS 1.60:2335) Avail: NTIS HC A03/MF A01 CSCL 01A

An overview is presented of the entire procedure developed for the aerodynamic design of the contoured wind tunnel liner for the NASA supercritical, laminar flow control (LFC), swept wing experiment. This numerical design procedure is based upon the simple idea of streamlining and incorporates several transonic and boundary layer analysis codes. The liner, presently installed in the Langley 8 Foot Transonic Pressure Tunnel, is about 54 ft long and extends from within the existing contraction cone, through the test section, and into the diffuser. LFC model testing has begun and preliminary results indicate that the liner is performing as intended. The liner design results presented in this paper,

however, are examples of the calculated requirements and the hardware implementation of them. Author

N84-33378*# United Technologies Research Center, East Hartford, Conn.
REFINEMENT AND EVALUATION OF HELICOPTER REAL-TIME SELF-ADAPTIVE ACTIVE VIBRATION CONTROLLER ALGORITHMS Final Report
Mark W. Davis NASA Aug. 1984 285 p refs
(Contract NAS2-11260)
(NASA-CR-3821; NAS 1.26:3821; R83-956149-16) Avail: NTIS HC A13/MF A01 CSCL 01A

A Real-Time Self-Adaptive (RTSA) active vibration controller was used as the framework in developing a computer program for a generic controller that can be used to alleviate helicopter vibration. Based upon on-line identification of system parameters, the generic controller minimizes vibration in the fuselage by closed-loop implementation of higher harmonic control in the main rotor system. The new generic controller incorporates a set of improved algorithms that gives the capability to readily define many different configurations by selecting one of three different controller types (deterministic, cautious, and dual), one of two linear system models (local and global), and one or more of several methods of applying limits on control inputs (external and/or internal limits on higher harmonic pitch amplitude and rate). A helicopter rotor simulation analysis was used to evaluate the algorithms associated with the alternative controller types as applied to the four-bladed H-34 rotor mounted on the NASA Ames Rotor Test Apparatus (RTA) which represents the fuselage. After proper tuning all three controllers provide more effective vibration reduction and converge more quickly and smoothly with smaller control inputs than the initial RTSA controller (deterministic with external pitch-rate limiting). It is demonstrated that internal limiting of the control inputs a significantly improves the overall performance of the deterministic controller. B.W.

N84-33379*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AN EXPERIMENTAL AND THEORETICAL INVESTIGATION OF DEPOSITION PATTERNS FROM AN AGRICULTURAL AIRPLANE
Dana J. Morris, Cynthia C. Croom, Cornelis P. vanDam (Kansas Univ., Lawrence), and Bruce J. Holmes Sep. 1984 157 p refs
(NASA-TP-2348; L-15718; NAS 1.60:2348) Avail. NTIS HC A08/MF A01 CSCL 01A

A flight test program has been conducted with a representative agricultural airplane to provide data for validating a computer program model which predicts aerially applied particle deposition. Test procedures and the data from this test are presented and discussed. The computer program features are summarized, and comparisons of predicted and measured particle deposition are presented. Applications of the computer program for spray pattern improvement are illustrated. Author

N84-33380*# National Aeronautics and Space Administration, Washington, D. C.
KASPRZYK AIRFOIL. THE FIRST WIND-TUNNEL TESTS
Tadeusz Wusatowski Oct. 1984 8 p Transl. into ENGLISH from Tech. Lonicza i Astronautyczna (Poland), v. 30, no. 9, Sep. 1975 p 9-10 Original language document was announced as A76-11893 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-77757; NAS 1.15:77757) Avail: NTIS HC A02/MF A01 CSCL 01A

The Kasprzyk slotted flap glider airfoil (the Kasper wing) enabling glider flight at 32 km/h and 0.5 m/sec descent speed was wind tunnel tested in the U.S. The test layout is described and reasons offered for discrepancies between wind tunnel results and Polish in flight data: high induced drag caused by relative size of model wing span and tunnel, by vortex attenuators on the model and their proximity to the tunnel wall, nonsimilarity between flow over a smooth wing and flow over the Kasprzyk wing with bound vortices, obstruction of the tunnel test chamber cross section by the model wing, discrepant Reynolds numbers, and model airfoil aspect ratio much smaller than the prototype. The overall results offer partial confirmation of the Kasprzyk theory, but further in tunnel and in flight studies are recommended. (IAA)

N84-33381*# National Aeronautics and Space Administration, Washington, D. C.
EXPERIMENTAL DETERMINATION OF THE INERTIA CONSTANTS OF AN AIRPLANE OR OF A MISSILE
H. Loiseau Mar. 1983 26 p refs Transl. into ENGLISH from La Rech. Aerospatiale (France), no. 120, 1967 p 53-62 Original language doc. was announced as A68-11437 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(NASA-TM-77767; NAS 1.15:77767) Avail: NTIS HC A03/MF A01 CSCL 01A

The possibility to measure the inertia constants of an airplane or of a missile by a unique experimental set up without having to materialize axes of rotation was investigated. It is sufficient to suspend the structure appropriately, to obtain the six natural modes determined by the suspension and to introduce these results as data into a computer. If the structure is very flexible it is necessary to take into account the first natural modes of deformation. Experiments on rigid and flexible models led to precise results and allow consideration of full scale measurements. The final goal is to provide, by a standard ground vibration test completed by the measured characteristics of the suspension modes, the set of data necessary for flutter calculations and for the determination of all the inertia constants. E.A.K.

N84-33382*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
HIGH REYNOLDS NUMBER TESTS OF THE CAST 10-2/DOA 2 AIRFOIL IN THE LANGLEY 0.3-METER TRANSONIC CRYOGENIC TUNNEL, PHASE 2
David A. Dress, Egon Stanewsky (DFVLR), Peggy D. McGuire, and Edward J. Ray Aug. 1984 307 p refs
(NASA-TM-86273; NAS 1.15:86273) Avail: NTIS HC A14/MF A01 CSCL 01A

Wind tunnel tests of an advanced technology airfoil, the CAST 10-2/DOA 2, were conducted in the Langley 0.3-Meter Transonic Cryogenic Tunnel (0.3-m TCT). This was the third of a series of tests conducted in a cooperative airfoil research program between the National Aeronautics and Space Administration and the Deutsche Forschungsund Versuchsanstalt fur Luft- und Raumfahrt e. V. For these tests, temperature was varied from 270 K to 110 K at pressures from 1.5 to 5.75 atmospheres. Mach number was varied from 0.60 to 0.80, and the Reynolds number (based on airfoil chord) was varied from 2 to 20 million. The aerodynamic data for the 7.62 cm chord airfoil model used in these tests is presented without analysis. Descriptions of the 0.3-m TCT, the airfoil model, the test instrumentation, and the testing procedures are included. Author

N84-33383*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
TRENDS IN COMPUTATIONAL CAPABILITIES FOR FLUID DYNAMICS
Victor L. Peterson Sep. 1984 12 p refs
(NASA-TM-86012; A-9860; NAS 1.15:86012) Avail: NTIS HC A02/MF A01 CSCL 01A

Milestones in the development of computational aerodynamics are reviewed together with past, present, and future computer performance (speed and memory) trends. Factors influencing computer performance requirements for both steady and unsteady flow simulations are identified. Estimates of computer speed and memory that are required to calculate both inviscid and viscous, steady and unsteady flows about airfoils, wings, and simple wing body configurations are presented and compared to computer performance which is either currently available, or is expected to be available before the end of this decade. Finally, estimates of the amounts of computer time that are required to determine flutter boundaries of airfoils and wings at transonic Mach numbers are presented and discussed. Author

N84-33384*# National Aeronautics and Space Administration, Washington, D. C.
A POSSIBILITY OF AVOIDING SURFACE ROUGHNESS DUE TO INSECTS
F. X. Wortmann Mar. 1984 10 p refs Transl. into ENGLISH of conf. paper "Uber eine Moeglichkeit zur Vermeidung der Insektenroughigkeit" presented at the 9th OSTIV Congr., 1963 p 644-646 Congr. held in Junin, Argentina, Feb. 1963 Original language document was announced as A64-11564 Submitted for publication Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-77419; NAS 1.15:77419) Avail: NTIS HC A02/MF A01 CSCL 01A

Discussion of a method for eliminating turbulence caused by the formation of insect roughness upon the leading edges and fuselage, particularly in aircraft using BLC. The proposed technique foresees the use of elastic surfaces on which insect roughness cannot form. The operational characteristics of highly elastic rubber surface fastened to the wing leading edges and fuselage edges are examined. Some preliminary test results are presented. The technique is seen to be advantageous primarily for short-haul operations. Author

N84-33385*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
DATA FROM TESTS OF A R4 AIRFOIL IN THE LANGLEY 0.3-METER TRANSONIC CRYOGENIC TUNNEL
Renaldo V. Jenkins, William G. Johnson, Jr., Acquilla S. Hill, Rudolph Mueller (Deutsche Forshungs- und Versuchsanstalt fuer Luftund Raumfahrt), and Guenter Redeker (Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt) Sep. 1984 356 p refs
(NASA-TM-85739; NAS 1.15:85739) Avail: NTIS HC A16/MF A01 CSCL 01A

Aerodynamic data for the DFVLR R4 airfoil are presented in both graphic and tabular form. The R4 was tested in the Langley 0.3-Meter Transonic Cryogenic Tunnel (TCT) at Mach number from 0.60 to 0.78 at angles of attack from -2.0 to 8.0 degrees. The airfoil was tested at Reynolds numbers of 4, 6, 10, 15, 30, and 40 million based on the 152.32 mm chord. Author

N84-33386*# Texas A&M Univ., College Station.
TRANSEP: A PROGRAM FOR HIGH LIFT SEPARATED FLOW ABOUT AIRFOILS Final Report
Leland A. Carlson Washington NASA Dec. 1980 56 p refs
(Grant NsG-1174)
(NASA-CR-3376; NAS 1.26:3376) Avail: NTIS HC A04/MF A01 CSCL 01A

A method and program called TRANSEP is presented that can be used for the analysis of the flow about a low speed airfoil under high lift, massive separation conditions. Since the present program is a modification of the direct-inverse TRANDES code, it can also be used for the design and analysis of transonic airfoils, including the effects of weak viscous interaction. Interactions on program usage, program modifications to convert TRANDES to TRANSEP, and sample cases and results are given. Author

N84-33387*# Kansas Univ. Center for Research, Inc., Lawrence. Flight Research Lab.
VORCAM: A COMPUTER PROGRAM FOR CALCULATING VORTEX LIFT EFFECT OF CAMBERED WINGS BY THE SUCTION ANALOGY
C. Edward Lan and Jen-Fu Chang Nov. 1981 123 p refs
(Grant NsG-1629)
(NASA-CR-165800; NAS 1.26:165800; CRINC-FRL-426-2) Avail: NTIS HC A06/MF A01 CSCL 01A

A user's guide to an improved version of Woodward's chord plane aerodynamic panel computer code is presumed. The guide can be applied to cambered wings exhibiting edge separated flow, including those with leading edge vortex flow at subsonic and supersonic speeds. New orientations for the rotated suction force are employed based on the momentum principal. The supersonic suction analogy method is improved by using an effective angle of attack defined through a semiempirical method. E.A.K.

N84-33388*# Boeing Military Airplane Development, Seattle, Wash.
PAN AIR: A COMPUTER PROGRAM FOR PREDICTING SUBSONIC OR SUPERSONIC LINEAR POTENTIAL FLOWS ABOUT ARBITRARY CONFIGURATIONS USING A HIGHER ORDER PANEL METHOD. VOLUME 4: MAINTENANCE DOCUMENT (VERSION 1.1) Contractor Report, Jan. 1978 - Apr. 1980
Pranab K. Baruah, John E. Bussoletti, David T.C. Chiang, William A. Massena, Franklin D. Nelson, David J. Furdon, and Kiyoharu Tsurusaki Washington NASA Nov. 1981 1045 p refs Sponsored in part by AF and Navy 4 Vol.
(Contract NAS2-9830)
(NASA-CR-3254; NAS 1.26:3254; D180-24910-4) Avail: NTIS HC A99/MF A01 CSCL 01A

The Maintenance Document is a guide to the PAN AIR software system, a system which computes the subsonic or supersonic linear potential flow about a body of nearly arbitrary shape, using a higher order panel method. The document describes the over-all system and each program module of the system. Sufficient detail is given for program maintenance, updating and modification. It is assumed that the reader is familiar with programming and CDC (Control Data Corporation) computer systems. The PAN AIR system was written in FORTRAN 4 language except for a few COMPASS language subroutines which exist in the PAN AIR library. Structured programming techniques were used to provide code documentation and maintainability.The operating systems accommodation are NOS 1.2, NOS/BE and SCOPE 2.1.3 on the CDC 6600, 7600 and Cyber 175 computing systems. The system is comprised of a data management system, a program library, an execution control module and nine separate FORTRAN technical modules. Each module calculates part of the posed PAN AIR problem. The data base manager is used to communicate between modules and within modules. The technical modules must be run in a prescribed fashion for each PAN AIR problem. In order to ease the problem of supplying the many JCL cards required to execute the modules, a separate module called MEC (Module Execution Control) was created to automatically supply most of the JCL cards. In addition to the MEC generated JCL, there is an additional set of user supplied JCL cards to initiate the JCL sequence stored on the system. Author

N84-33389# National Aeronautical Establishment, Ottawa (Ontario). High Speed Aerodynamics Lab.
TRANSONIC EQUIVALENCE RULE WITH LIFT Aeronautical Report
Y. Y. Chan Mar. 1984 47 p
(AD-A143591; NAE-LR-614-Pt-2; NRC-23412) Avail: NTIS HC A03/MF A01 CSCL 20/4

The experimental study of the transonic equivalence rule with lift, has been extended to include a configuration of swept-back wing-body and the corresponding equivalent bodies for lift and zero-lift. For zero lift, the wing-body is shown to have higher wave drag than that of the equivalent body. At lifting condition, the analyses of the data, including those of the delta wing-bodies have verified the similitude of drag rise due to lift between the wing-bodies. The additional drag induced by the effective area due to lift on the equivalent body was found to agree reasonably with the wave drag generated by lift on the wing-body. The experiment thus verified the area rule with lift which must be considered in the optimal design of transonic configurations. GRA

N84-33390# Calspan Field Services, Inc., Arnold Air Force Station, Tenn.
UNSTEADY VISCOUS-INVISCID INTERACTION PROCEDURES FOR TRANSONIC AIRFOIL FLOWS Final Report, 1 Oct. 1982 - 30 Sep. 1983
T. L. Donegan Jul. 1984 55 p
(AD-A143764; AEDC-TR-84-7) Avail: NTIS HC A04/MF A01 CSCL 20/4

This study is concerned with the development of a com-

putational algorithm for viscous-inviscid interactions with application to two-dimensional transonic airfoil flows. The inner viscous flow is computed by the integral method of Whitfield, while the external flow is calculated by Jameson's Euler equation code. The two flows are matched by a linearized boundary condition at the airfoil surface. Of particular interest is the use of a time-dependent boundary-layer calculation method since it has been determined that a time-dependent method is desirable for extending the interaction method to three-dimensional flows. In general, it is found that the agreement between theoretical prediction and experimental data is satisfactory for engineering calculations. GRA

N84-33391# Applied Research Lab., State College, Pa.
SIDEWALL BOUNDARY LAYER CORRECTIONS IN SUBSONIC, 2-DIMENSIONAL AIRFOIL-HYDROFOIL TESTING Technical Memo
A. L. Treaster, P. P. Jacobs, Jr., and G. B. Gurney 3 Mar. 1984 43 p
(Contract N00024-79-C-6043)
(AD-A144002; AD-E850686; ARL/PSU/TM-84-43) Avail: NTIS HC A03/MF A01 CSCL 20/4

Historically, two-dimensional airfoil or hydrofoil section characteristics have been obtained by measuring individually the lift, drag and pitching moment by the most accurate technique available. The use of force balances to measure the three quantities simultaneously has met with only partial success. Although the lift and pitching moment data have usually been acceptable, the drag data have varied by as much as an order or magnitude from previous reference data. To investigate the parameters which influence two-dimensional force measurements, an experimental program was conducted in the subsonic wind tunnel of the Applied Research Laboratory at The Pennsylvania State University. From the results of this test program, the sidewall boundary layer was identified as the primary factor contributing to the erroneous drag measurements. A correction procedure which is based on the airfoil/hydrofoil geometry, the flow environment and the measured data was developed. Corrected data from the subject test program and from similar programs in other experimental facilities for both symmetrical and cambered sections are in good agreement with the reference data in all cases. Author (GRA)

N84-33392# Oregon State Univ., Corvallis. Wind Resource Assessment Lab.
WAKE STUDIES AT THE FLOWIND VERTICAL AXIS WIND TURBINE GENERATOR SITE
Robert W. Baker, Stel N. Walker, and Paul C. Katen Mar. 1984 88 p refs
(Contract DE-AC79-81BP-29182)
(DE84-014837; DOE/BP-232; Rept-83-10) Avail: NTIS HC A05/MF A01

In a continuing effort to study and characterize various types and sizes of wind turbine generator wakes, a test program was conducted at the FloWind 170 kW vertical axis wind turbine (VAWT) near Ellensburg, Washington. The wake behind the 90 ft. tall Darrieus VAWT was measured using fixed place and portable kite anemometers. Downwind velocity deficits were computed from 3 to 9 diameters along the wake centerline at rotor midpoint (55 ft.) and perpendicular to the wake. Wake turbulence characteristics were also measured. The measured velocity deficits were compared to wake model calculations. DOE

N84-33393# Technische Hochschule, Darmstadt (West Germany). Inst. fuer Flugtechnik.
EXPERIMENTAL INVESTIGATIONS ON AIRFOILS WITH DIFFERENT GEOMETRIES IN THE DOMAIN OF HIGH ANGLES OF ATTACK Final Report [EXPERIMENTELLE UNTERSUCHUNGEN AN FLUEGELN VERSCHIEDENER GOEMETRIE IM HOHEN ANSTELLWINKELBEREICH]
Johannes Keil 26 Mar. 1984 95 p refs In GERMAN
(Contract DFG-HA-515/57)
(Rept-A-5/84-Pt-1) Avail: NTIS HC A05/MF A01

Wind tunnel tests were conducted on airfoil models in order to study the flow separation phenomena occurring for high angles of attack. Pressure distribution on wings of different geometries were measured. Results show that for three-dimensional airfoils layout and span lift play a role. Separation effects on airfoils with moderate extension are three-dimensional. The flow domains separated from the air foil must be treated three-dimensionally. The rolling-up of separated vortex layers increases with angle in intensity and induction effect and shows strong nonlinearities. Boundary layer material moves perpendicularly to the flow direction due to the pressure gradients at the airfoil; this has a stabilizing effect. The separation starts earlier with increasing pointed profiles. Author (ESA)

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

N84-33394* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
FIRE BLOCKING SYSTEMS FOR AIRCRAFT SEAT CUSHIONS Patent
John A. Parker and Demetrius A. Kourtides, inventors (to NASA) Issued 7 Aug. 1984 9 p Filed 23 Dec. 1982 Supersedes N83-17525 (21 - 08, p 1132)
(NASA-Case-ARC-11423-1; NAS 1.71:ARC-11423-1; US-Patent-4,463,465; US-Patent-Appl-SN-452466; US-Patent-Class-5-459; US-Patent-Class-297-DIG.5; US-Patent-Class-428-71; US-Patent-Class-428-76; US-Patent-Class-428-246; US-Patent-Class-428-280; US-Patent-Class-428-287; US-Patent-Class-428-304.4; US-Patent-Class-428-319.1; US-Patent-Class-428-423.5; US-Patent-Class-428-921) Avail: US Patent and Trademark Office CSCL 01C

A configuration and method for reducing the flammability of bodies of organic materials that thermally decompose to give flammable gases comprises covering the body with a flexible matrix that catalytically cracks the flammable gases to less flammable species. Optionally, the matrix is covered with a gas impermeable outer layer. In a preferred embodiment, the invention takes the form of an aircraft seat in which the body is a poly(urethane) seat cushion, the matrix is an aramid fabric or felt and the outer layer is an aluminum film.
Official Gazette of the U.S. Patent and Trademark Office

N84-33395# Dayton Univ., Ohio. Div. of Aerospace Mechanics.
IMPROVING THE BIRDSTRIKE RESISTANCE AND DURABILITY OF AIRCRAFT WINDSHIELD SYSTEMS: PROGRAM TECHNICAL SUMMARY Final Report, 20 Feb. 1980 - 20 Feb. 1984
Blaine S. West Wright-Patterson AFB, Ohio AFWAL May 1984 26 p
(Contract F33615-80-C-3401)
(AD-A143712; UDR-TR-84-12; AFWAL-TR-84-3039) Avail: NTIS HC A03/MF A01 CSCL 01/2

This final report defines the program objectives, presents an abstract for each technical report generated, and lists the major papers and presentations resulting from the technical effort. Major program accomplishments, both generic and specific, are also enumerated. Author (GRA)

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications.*

N84-33396*# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
FAULT-TOLERANT SYSTEM CONSIDERATIONS FOR A REDUNDANT STRAPDOWN INERTIAL MEASUREMENT UNIT
Paul Motyka, Renato Ornedo, and Rami Mangoubi Aug. 1984 116 p refs
(Contract NAS1-16887)
(NASA-CR-172426; NAS 1.26:172426; CSDL-R-1717) Avail: NTIS HC A06/MF A01 CSCL 01D

The development and evaluation of a fault-tolerant system for the Redundant Strapdown Inertial Measurement Unit (RSDIMU) being developed and evaluated by the NASA Langley Research Center was continued. The RSDIMU consists of four two-degree-of-freedom gyros and accelerometers mounted on the faces of a semi-octahedron which can be separated into two halves for damage protection. Compensated and uncompensated fault-tolerant system failure decision algorithms were compared. An algorithm to compensate for sensor noise effects in the fault-tolerant system thresholds was evaluated via simulation. The effects of sensor location and magnitude of the vehicle structural modes on system performance were assessed. A threshold generation algorithm, which incorporates noise compensation and filtered parity equation residuals for structural mode compensation, was evaluated. The effects of the fault-tolerant system on navigational accuracy were also considered. A sensor error parametric study was performed in an attempt to improve the soft failure detection capability without obtaining false alarms. Also examined was an FDI system strategy based on the pairwise comparison of sensor measurements. This strategy has the specific advantage of, in many instances, successfully detecting and isolating up to two simultaneously occurring failures. Author

N84-33397# National Aerospace Lab., Amsterdam (Netherlands). Flight Div.
APPLICATION OF A PROBABILISTIC TRACKING FILTER: A FIRST EVALUATION WITH EMPHASIS ON AIR TRAFFIC CONTROL. PART 1: EVALUATION RESULTS
H. A. P. Blom 7 Feb. 1984 49 p refs 2 Vol.
(NLR-TR-82088-U-Pt-1) Avail: NTIS HC A03/MF A01

In order to gain insight into the problem of tracking an aircraft, using uncertain radar measurements, a fundamental study on the application of nonlinear filtering theory was undertaken. The theory on modeling and filtering of Markov processes, and Martingale theory were used. A complete probabilistic tracking algorithm for a surveillance radar was obtained. Evaluations partly based on the tracking results for a number of live traffic samples show that the algorithm gives accurate, consistent estimates. Author (ESA)

N84-33398# National Aerospace Lab., Amsterdam (Netherlands). Flight Div.
APPLICATION OF A PROBABILISTIC TRACKING FILTER: A FIRST EVALUATION WITH EMPHASIS ON AIR TRAFFIC CONTROL. PART 2: LIVE TRAFFIC SAMPLES
H. A. P. Blom 7 Feb. 1984 177 p ref 2 Vol.
(NLR-TR-82088-U-Pt-2) Avail: NTIS HC A09/MF A01

In order to gain insight into the problem of tracking an aircraft, using uncertain radar measurements, a fundamental study on the application of nonlinear filtering theory was undertaken. The theory on modeling and filtering of Markov processes, and Martingale theory were used. A complete probabilistic tracking algorithm for a surveillance radar was obtained. Evaluations partly based on the tracking results for a number of live traffic samples show that the algorithm gives accurate, consistent estimates. Author (ESA)

N84-33399# National Aerospace Lab., Amsterdam (Netherlands). Vliegtuigen Afteling.
THE MICROWAVE LANDING SYSTEM (MLS)
T. H. M. Hagenberg Nov. 1983 24 p refs In DUTCH; ENGLISH summary Presented at Ned. Electron. en Radiogenootschap Work Meeting, Delft, 13 Dec. 1983
(NLR-MP-83070-U) Avail: NTIS HC A02/MF A01

The Microwave Landing System (MLS) is described. It is an approach and landing aid, standardized by the International Civil Aviation Organization to replace the existing Instrument Landing System. Possible MLS configurations, system operation, ground equipment, and the related avionics are described. Author (ESA)

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N84-33400*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
HELICOPTER ANTI-TORQUE SYSTEM USING STRAKES Patent Application
Henry L. Kelley (Army Air Mobility Research and Development Lab., Hampton, Va.), John C. Wilson (Army Air Mobility Research and Development Lab., Hampton, Va.), and Arthur E. Phelps, inventors (to NASA) (Army Air Mobility Research and Development Lab., Hampton, Va.) Filed 11 Sep. 1984 12 p Sponsored by NASA
(NASA-Case-LAR-13233-1; NAS 1.71:LAR-13233-1; US-Patent-Appl-SN-649329) Avail: NTIS HC A02/MF A01 CSCL 01C

A helicopter is disclosed with a system for controlling main-rotor torque which reduces the power and size requirements of conventional anti-torque means. The torque countering forces are generated by disrupting the main rotor downwash flowing around the fuselage. The downwash flow is separated from the fuselage surface by a strake positioned at a specified location on the fuselage. This location is determined by the particular helicopter wash pattern and fuselage configuration, generally being located between 20 deg before top dead center (TDC) and 80 deg from TDC on the fuselage side to which the main rotor blade approaches during rotation. The strake extends along the fuselage from the cabin section to the aft end and can be continuous or separated for aerodynamic surfaces such as a horizontal stabilizer. NASA

N84-33401*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
HOVER TEST OF A FULL-SCALE HINGELESS ROTOR
William Warmbrodt and Randall L. Peterson Aug. 1984 26 p refs
(NASA-TM-85990; A-9827; NAS 1.15:85990) Avail: NTIS HC A03/MF A01 CSCL 01C

The performance and aeroelastic stability in hover of a 9.8-m diameter, hingeless helicopter rotor system was evaluated. Rotor performance and inplane damping data were obtained for rotor operation between 350 and 425 rpm for thrust coefficients (CT/sigma) between 0.0 and 0.12. At constant rotor thrust, a minimum in rotor inplane damping was measured at 400 rpm. Good agreement is shown between experimental performance data and predicted performance. The influence of different aerodynamic inflow models on predicting damping levels is also shown. The best correlation with experimental stability data was obtained when a dynamic inflow model was used instead of static or quasistatic inflow models. Comparison with other full scale, hingeless rotor data in hover is presented. The hingeless rotor data and data from a full scale, bearingless main rotor test performed on the same general purpose test apparatus were compared. Although the bearingless rotor was more highly damped at design tip speed and 1-g thrust operation, greater sensitivity to operating conditions

is shown. At low thrust levels the bearingless main rotor is less damped than the hingeless rotor. E.A.K.

N84-33402*# Lockheed-California Co., Burbank.
INTEGRATED TECHNOLOGY WING DESIGN STUDY Final Report, Nov. 1979 - Dec. 1980
A. P. Hays, W. E. Beck, W. H. Morita, B. J. Penrose, R. E. Skarshaug, and B. S. Wainfan Washington NASA Aug. 1984 460 p
(Contract NAS1-16273)
(NASA-CR-3586; NAS 1.26:3586; LR-30000) Avail: NTIS HC A20/MF A01 CSCL 01C

The technology development costs and associated benefits in applying advanced technology associated with the design of a new wing for a new or derivative trijet with a capacity for 350 passengers and maximum range of 8519 km, entering service in 1990 were studied. The areas of technology are: (1) airfoil technology; (2) planform parameters; (3) high lift; (4) pitch active control system; (5) all electric systems; (6) E to 3rd power propulsion; (7) airframe/propulsion integration; (8) graphite/epoxy composites; (9) advanced aluminum alloys; (10) titanium alloys; and (11) silicon carbide/aluminum composites. These technologies were applied to the reference aircraft configuration. Payoffs were determined for block fuel reductions and net value of technology. These technologies are ranked for the ratio of net value of technology (NVT) to technology development costs. E.A.K.

N84-33403*# Douglas Aircraft Co., Inc., Long Beach, Calif.
RESULTS OF DESIGN STUDIES AND WIND TUNNEL TESTS OF AN ADVANCED HIGH LIFT SYSTEM FOR AN ENERGY EFFICIENT TRANSPORT
Wayne R. Oliver Dec. 1980 373 p refs
(Contract NAS1-14744)
(NASA-CR-159389; NAS 1.26:159389) Avail: NTIS HC A16/MF A01 CSCL 01C

The development of an advanced technology high lift system for an energy efficient transport incorporating a high aspect ratio supercritical wing is described. This development is based on the results of trade studies to select the high lift system, analysis techniques utilized to design the high lift system, and results of a wind tunnel test program. The program included the first experimental low speed, high Reynolds number wind tunnel test for this class of aircraft. The experimental results include the effects on low speed aerodynamic characteristics of various leading and trailing edge devices, nacelles and pylons, aileron, spoilers, and Mach and Reynolds numbers. Results are discussed and compared with the experimental data and the various aerodynamic characteristics are estimated. E.A.K.

N84-33404# Naval Ship Research and Development Center, Bethesda, Md. Dept. of Aviation and Surface Defects.
AERODYNAMIC FEASIBILITY FOR AIRBORNE RETRIEVAL OF A REMOTELY PILOTED VEHICLE Final Report
Earl F. McCabe, Jr. and David W. Lacey Nov. 1976 46 p
(W33-59)
(AD-A143695; DTNSRDC-76/0043) Avail: NTIS HC A03/MF A01 CSCL 01/2

A combined wind tunnel/computer analysis was undertaken to evaluate the aerodynamic feasibility for airborne recovery of a fixed-wing remotely piloted vehicle (RPV). A mpa of aerodynamic loads interacting on the aircraft and RPV was obtained in the wind tunnel. The flow field was then represented mathematically and used to evaluate the aerodynamic feasibility of airborne retrieval. It was concluded that retrieval forward of the aircraft is potentially dangerous, unless a separation of more than two meters is maintained; retrieval aft of the aircraft is aerodynamically safe without restriction. In addition, it was determined that the primary effect of the aircraft flow field on the RPV was in the pitch plane. Author (GRA)

N84-33405# Naval War Coll., Newport, R. I.
NAVAL APPLICATIONS FOR REMOTELY PILOTED VEHICLES (RPV'S)
H. M. Hufford 22 Jun. 1984 28 p
(AD-A143826) Avail: NTIS HC A03/MF A01 CSCL 01/3

The time has come for the U.S. Navy to employ remotely piloted vehicles (RPV's) launched either from the deck of ships or from naval aircraft to perform a wide variety of tactical missions in support of the fleet. Expendable or retrievable RPV's are needed today to assist in reconnaissance, over the horizon targeting, and electronic warfare. This paper explores how effective RPV's can be today and why, in an era in which the Soviets have outnumbered the U.S. in military weapons systems and in which the U.S. budget is very tight, the relatively inexpensive RPV can provide the force multiplier needed to close the gap. The paper recommends that the U.S. Navy implement an RPV program as soon as possible. GRA

N84-33406# Southwest Research Inst., San Antonio, Tex.
DEVELOPMENT OF ACCELERATED FUEL-ENGINE QUALIFICATION PROCEDURES Final Technical Report, Oct. 1981 - Sep. 1983
J. A. Russell, J. P. Cuellar, Jr., R. A. Alvarez, R. L. Rentz, and T. J. Timbario Sep. 1983 142 p
(Contract DAAK70-81-C-0209)
(AD-A143845; SWRI-6797/4) Avail: NTIS HC A07/MF A01 CSCL 15/5

Activities and findings are described for a 24-month program aimed at the development of procedures for accelerating the qualification of new fuels on Army equipment, emphasizing those derived from oil shale and coal. Principal activities were the development of bench and component test methodology for specific testing of properties peculiar to non-petroleum derived liquid hydrocarbon fuels not now covered under present federal or military fuels specifications. Laboratory test method development entailed modification of the a Jet Fuel Thermal Oxidation Tester (JFTOT) to evaluate not only thermal stability but elastomer compatibility by incorporating a heated reservoir to examine fuel effects on elastomer swell and hardness change as well as elastomer leachate on thermal stability. Lubricity evaluations entailed the application of the Ball-on-Cylinder-Machine (BOCM). Diesel injector pumps were subjected to 300-hour endurance testing using a recirculatory fuel loop and maintaining the lubricity of the fuel at very poor levels by clay filtration. Author (GRA)

N84-33407# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
FLIGHT OPERATION MANUAL FOR THE MI-8 HELICOPTER
G. Bugayev 11 Jul. 1984 15 p Transl. into ENGLISH from Rukovodstvo po Letnoy Ekspluatatsii Vertoleta Mi-8 (USSR) 1971 6 p
(AD-A143860; FTD-ID(RS)T-0320-84) Avail: NTIS HC A02/MF A01 CSCL 01/2

This flight manual lists aerodynamic characteristics and instructions for the successful operation of the MI-8 helicopter. Weather data, safety considerations, durability and handling qualities are described. B.W.

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography.*

N84-33408# Army Aviation Systems Command, St. Louis, Mo. Avionics Research and Development Activity.
A DUAL DIGITAL TO VIDEO CONVERTER AND COLOR VIDEO INSETTER FOR AVIONICS SYMBOLOGY AND MESSAGES
Edward A. Karcher and Vincent J. Organic Jul. 1984 15 p
(AD-A143772; USAAVSCOM-TR-84-E-3) Avail: NTIS HC A02/MF A01 CSCL 09/5

The design, interface, and operation of a general purpose raster

scan display, digital-to-video converter and color video insetter is described which is capable of airborne or vehicular operation.
GRA

N84-33409# National Aerospace Lab., Amsterdam (Netherlands). Vliegtuigen Hoofdafdeling.
THE APPLICATION OF FIBER OPTICS IN AIRCRAFT INSTRUMENTATION: TECHNOLOGY ASSESSMENT
J. C. T. vanderVeen 29 Apr. 1983 42 p refs In DUTCH; ENGLISH summary
(NLR-TR-83048-U) Avail: NTIS HC A03/MF A01

The utilization of fiber optics in an aircraft environment is treated. Fiber optics appears very well suited for the applications to data transmission medium in aircraft. The advantages are substantial: galvanic isolation, electromagnetic compatibility, savings in volume and weight, and superior transmission qualities.
Author (ESA)

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N84-33410* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
AIR MODULATION APPARATUS Patent
Dean T. Lenahan (GE, Cincinnati), Robert J. Corsmeier (GE, Cincinnati), and Albert P. Sterman, inventors (to NASA) (GE, Cincinnati) Issued 22 Nov. 1983 8 p Filed 25 Feb. 1981 Supersedes N83-30957 (21 - 19, p 3136) Sponsored by NASA
(NASA-Case-LEW-13524-1; NAS 1.71:LEW-13524-1; US-Patent-4,416,111; US-Patent-Appl-SN-238257; US-Patent-Class-60-39.29; US-Patent-Class-60-39.83; US-Patent-Class-415-115) Avail: US Patent and Trademark Office CSCL 20E

An air modulation apparatus, such as for use in modulating cooling air to the turbine section of a gas turbine engine is described. The apparatus includes valve means disposed around an annular conduit, such as a nozzle, in the engine cooling air circuit. The valve means, when in a closed position, blocks a portion of the conduit, and thus reduces the amount and increases the velocity of cooling air flowing through the nozzle. The apparatus also includes actuation means, which can operate in response to predetermined engine conditions, for enabling opening and closing of the valve means.
Official Gazette of the U.S. Patent and Trademark Office

N84-33411*# National Aeronautics and Space Administration, Washington, D. C.
COMPARISON OF COMBUSTION EFFICIENCIES FOR RAMJET ENGINES
Juergen W. Bergmann Sep. 1984 10 p refs Transl. into ENGLISH from Z. fuer Flugwiss. and Weltrauforsch. (West Germany), v. 8, no. 2, Mar. - Apr. 1984 p 129-133 Original language document was announced as A84-34723 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-77749; NAS 1.15:77749) Avail: NTIS HC A02/MF A01 CSCL 21E

Four different combustion efficiencies commonly used for assessing ramjet engines are compared. The mixture ratios cover a range from stoichiometric to an equivalence ratio of 0.2, and the polyethylene/air propellant system is used. The ratio of effective to ideal temperature rise is taken as reference efficiency. As might be expected, major differences can be observed near stoichiometric and down to equilvalence ratios of 0.5. These are quantitatively demonstrated.
(IAA)

N84-33412*# Arizona State Univ., Tempe. Dept. of Mechanical and Aerospace Engineering.
AN EXPERIMENTAL INVESTIGATION OF GAS JETS IN CONFINED SWIRLING AIR FLOW Final Report
Ronald M. C. So, Saad A. Ahmed, and Hukam C. Mongia Washington NASA Sep. 1984 159 p refs
(Grant NAG3-260)
(NASA-CR-3832; L-2178; NAS 1.26:3832) Avail: NTIS HC A08/MF A01 CSCL 21E

The fluid dynamics of jets in confined swirling flows which is of importance to designers of turbine combustors and solid fuel ramjets used to power missiles fired from cannons were examined. The fluid dynamics of gas jets of different densities in confined swirling flows were investigated. Mean velocity and turbulence measurements are made with a one color, one component laser velocimeter operating in the forward scatter mode. It is shown that jets in confined flow with large area ratio are highly dissipative which results in both air and helium/air jet centerline velocity decays. For air jets, the jet like behavior in the tube center disappears at about 20 diameters downstream of the jet exit. This phenomenon is independent of the initial jet velocity. The turbulence field at this point also decays to that of the background swirling flow. A jet like behavior in the tube center is noticed even at 40 diameters for the helium/air jets. The subsequent flow and turbulence field depend highly on the initial jet velocity. The jets are fully turbulent, and the cause of this difference in behavior is attributed to the combined action swirl and density difference. This observation can have significant impact on the design of turbine combustors and solid fuel ramjets subject to spin.
E.A.K.

N84-33413*# National Aeronautics and Space Administration, Washington, D. C.
NON-DESTRUCTIVE EVALUATION TECHNIQUES, HIGH TEMPERATURE CERAMIC COMPONENT PARTS FOR GAS TURBINES
H. Reiter, S. Hirsekorn, J. Lottermoser, and K. Goebbels Sep. 1984 39 p refs Transl. into ENGLISH of "ZfP von Hochtemperatur-Keramik-Bauteilen fuer KfZ-Turbinen" rept. IzfP-800305-TW Inst. fuer Zerstoerungsfreie Pruefverfahren, Saarbruecken, West Germany, 6 Mar. 1980 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3199)
(NASA-TM-77755; NAS 1.15:77755) Avail: NTIS HC A03/MF A01 CSCL 21E

This report concerns studies conducted on various tests undertaken on material without destroying the material. Tests included: microradiographic techniques, vibration analysis, high-frequency ultrasonic tests with the addition of evaluation of defects and structure through analysis of ultrasonic scattering data, microwave tests and analysis of sound emission.
B.W.

N84-33414*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
RESPONSE OF A SMALL-TURBOSHAFT-ENGINE COMPRESSION SYSTEM TO INLET TEMPERATURE DISTORTION
Thomas J. Biesiadny, Gary A. Klann, and Jeffrey K. Little Sep. 1983 28 p refs
(NASA-TM-83765; E-2198; NAS 1.15:83765; USAAVSCOM-TR-84-C-13) Avail: NTIS HC A03/MF A01 CSCL 21E

An experimental investigation was conducted into the response of a small-turboshaft-engine compression system to steady-state and transient inlet temperature distortions. Transient temperature ramps ranged from less than 100 deg K/sec to above 610 deg K/sec and generated instantaneous temperatures to 420 K above ambient. Steady-state temperature distortion levels were limited by the engine hardware temperature limit. Simple analysis of the steady-state distortion data indicated that a particle separator at the engine inlet permitted higher levels of temperature distortion

before onset of compressor surge than would be expected without the separator. Author

N84-33415*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PROPULSION CONTROL EXPERIENCE USED IN THE HIGHLY INTEGRATED DIGITAL ELECTRONIC CONTROL (HIDEC) PROGRAM Final Report
Lawrence P. Myers and Frank W. Burcham, Jr. Oct. 1984 18 p refs Presented at the SAE Aerospace Congr. and Exposition, Long Beach, Calif., 15-18 Oct. 1984
(NASA-TM-85914; H-1267; NAS 1.15:85914) Avail: NTIS HC A02/MF A01 CSCL 21E

The highly integrated digital electronic control (HIDEC) program will integrate the propulsion and flight control systems on an F-15 airplane at NASA Ames Research Center's Dryden Flight Research Facility. Ames-Dryden has conducted several propulsion control programs that have contributed to the HIDEC program. The digital electronic engine control (DEEC) flight evaluation investigated the performance and operability of the F100 engine equipped with a full-authority digital electronic control system. Investigations of nozzle instability, fault detection and accommodation, and augmentor transient capability provided important information for the HIDEC program. The F100 engine model derivative (EMD) was also flown in the F-15 airplane, and airplane performance was significantly improved. A throttle response problem was found and solved with a software fix to the control logic. For the HIDEC program, the F100 EMD engines equipped with DEEC controls will be integrated with the digital flight control system. The control modes to be implemented are an integrated flightpath management mode and an integrated adaptive engine control system mode. The engine control experience that will be used in the HIDEC program is discussed. Author

N84-33416*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Business Group.
NOZZLE PERFORMANCE CALIBRATION AND TURBOMACHINERY OPERATIONAL ANALYSIS OF TURBOPOWERED SIMULATORS (TPS) FOR THE NASA-LANGLEY EET PROPULSION AIRFRAME INTEGRATION INVESTIGATION Final Report
R. Kevin Rowe Aug. 1982 125 p
(Contract NAS1-15345)
(NASA-CR-165949; NAS 1.26:165949; R82AEB436) Avail: NTIS HC A06/MF A01 CSCL 21E

The Boeing flight simulator chamber facility energy efficient transport (EET) propulsion/airframe integration investigation was tested. Two turbopowered simulators (TPS) were calibrated with four different nacelle configurations. Two nacelle configurations were calibrated on each TPS, each calibration simulating the full nozzle pressure ratio range encountered in a one atmosphere total pressure wind tunnel operating over a Mach number range from 0.70 to 0.90 Mach. The results of the calibration test are in the form of velocity and discharge coefficient which is used in determining the simulator thrust while the TPS is operating in the wind tunnel. E.A.K.

N84-33468# Motoren- und Turbinen-Union Muenchen G.m.b.H. (West Germany).
MEASURES FOR MATERIALS CONSERVATION IN AERO-ENGINE CONSTRUCTION
H. Huff, R. Graeter, and R. Froehling *In* AGARD Mater. Substitution and Recycling Apr. 1984 9 p (For primary document see N84-33465 23-23)
Copyright. Avail: NTIS HC A13/MF A01

N84-33470# General Electric Co., Cincinnati, Ohio. Engineering Materials Technology Labs.
GAS TURBINE ENGINE DESIGN CONSIDERATIONS AS RELATED TO ALLOYS OF HIGH CRITICAL ELEMENT CONTENT
Robert A. Sprague *In* AGARD Mater. Substitution and Recycling Apr. 1984 6 p (For primary document see N84-33465 23-23)
Copyright. Avail: NTIS HC A13/MF A01

N84-33476# GEC Turbine Generators Ltd., Whetstone (England). Central Metallurgical Labs.
PRACTICAL IMPLICATIONS OF THE USE OF ALUMINIDE COATINGS FOR THE CORROSION PROTECTION OF SUPERALLOYS IN GAS TURBINES
A. Strang, E. Lang (Commission of the European Communities), and R. Pichoir (ONERA) *In* AGARD Mater. Substitution and Recycling Apr. 1984 35 p refs (For primary document see N84-33465 23-23)
Avail: NTIS HC A13/MF A01

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N84-33417*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Business Group.
SUBSONIC/TRANSONIC STALL FLUTTER INVESTIGATION OF A ROTATING RIG Final Report
R. R. Jutras, R. B. Fost, R. M. Chi, and B. F. Beacher Feb. 1981 319 p refs
(Contract NAS3-20605)
(NASA-CR-174625; NAS 1.26:174625; R81AEG282) Avail: NTIS HC A14/MF A01 CSCL 01C

Stall flutter is investigated by obtaining detailed quantitative steady and aerodynamic and aeromechanical measurements in a typical fan rotor. The experimental investigation is made with a 31.3 percent scale model of the Quiet Engine Program Fan C rotor system. Both subsonic/transonic (torsional mode) flutter and supersonic (flexural) flutter are investigated. Extensive steady and unsteady data on the blade deformations and aerodynamic properties surrounding the rotor are acquired while operating in both the steady and flutter modes. Analysis of this data shows that while there may be more than one traveling wave present during flutter, they are all forward traveling waves. M.A.C.

N84-33418*# Hughes Helicopters, Culver City, Calif.
PRELIMINARY DESIGN STUDY OF A HIGHER HARMONIC BLADE FEATHERING CONTROL SYSTEM Final Report
R. W. Powers Jun. 1980 112 p refs
(Contract NAS1-14552)
(NASA-CR-159327; NAS 1.26:159327; HH-80-415) Avail: NTIS HC A06/MF A01 CSCL 01C

The feasibility to incorporate an active higher harmonic control (HHC) system on an OH-6A rotorcraft was demonstrated. The introduction of continuously modulated low amplitude 4P feathering showed potential for reducing rotor transmitted oscillatory loads. The design implementation of this system on a baseline OH-6A required generation of a hydraulic power system, control actuator placement and design integration of an electronic subsystem comprised of an electronic control unit (ECU) and digital microcomputer. Various placements of the HHC actuators in the primary control system are evaluated. Assembly drawings of the actuator concepts and control rigging are presented. The advantages of generating both hydraulic power and 4F control motions in the nonrotating system is confirmed. E.A.K.

N84-33419# Princeton Univ., N. J. Dept. of Mechanical and Aerospace Engineering.
IN-FLIGHT INVESTIGATION OF LONGITUDINAL FLYING QUALITIES CRITERIA Final Report, 19 Sep. 1980 - 31 Mar. 1982
D. B. II Glade and M. E. Murphy Warminster, Pa. Naval Air Development Center Feb. 1983 101 p
(Contract N62269-80-C-0720)
(AD-A143614; MAE-1594; NADC-80157-60) Avail: NTIS HC A06/MF A01 CSCL 01/4

Flight tests were conducted to aid in the development of new longitudinal flying qualities criteria and to investigate some of the implications of equivalent system analysis, in which an aircraft's

high-order dynamics are modelled by a low-order system. These tests were flown by U.S. Navy test pilots in Princeton's Variable-Response Research Aircraft (VRA), a fly-by-wire, in-flight simulator. Both analog and digital (microprocessor-based) systems were used for closed-loop control. Tests of 22 dynamic configurations evaluated by 5 pilots are reported, with emphasis on tasks representative of approach and landing on an aircraft carrier. A standard carrier landing mirror provided pilot cues, and all flights were evaluated from the long approach through touchdown. Conclusions regarding flying qualities are based on a limited number of flights. Ratings of conventional configurations generally indicated a compatibility with present flying qualities boundaries based upon the control anticipation parameter (CAP), but the latter do not adequately predict pilot ratings for short period natural frequencies of 2 rad/sec and less. CAP tended to confirm landing task ratings, but it did not confirm ratings based solely on pitch response. GRA

N84-33420# Department of the Air Force, Washington, D.C.
DIRECT LIFT COMMAND BLENDING Patent Application
J. D. McAllister, inventor (to Air Force) Filed 29 May 1984 22 p (AD-D011178; US-Patent-Appl-SN-614904) Avail: NTIS HC A02/MF A01 CSCL 01/4

The rapid and precise control of an aircraft flight path is obtained by a continuous blending of direct lift and conventional longitudinal control system commands by a unit that consists of a combination of a linear gradient and breakout element, a blending integrator, a nonlinear element, a Direct Lift Limit element, an interconnect gain element, and three summing junctions. Direct Lift is blended with conventional control as the pilot manual command is conditioned by the linear gradient and breakout element to provide the command signal to the first summing junctions. The difference between this command and the output of the blending integrator is applied to the recentering nonlinear element. The direct lift command is obtained by passing the output of the recentering nonlinear element through the direct lift limit element. The second summing junction is used to reform the total system command which is applied to the third summing junction. The conventional longitudinal command is the output of the third summing junction; this output being the difference between the total system command and the direct lift command as modified by the interconnect gain. Author (GRA)

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N84-33421 Department of the Navy, Washington, D. C.
AIRCRAFT LOADING ADAPTER FOR USE WITH ORDNANCE LIFT VEHICLE Patent
V. E. Renfro, R. L. Gudgeon, J. P. Clelland, and C. C. Cole, inventors (to Navy) Issued 8 May 1984 5 p Supersedes AD-D009563
(AD-D011147; US-Patent-4,447,186; US-Patent-Appl-SN-363349; US-Patent-Class-414-589) Avail: US Patent and Trademark Office CSCL 13/6

An adapter for use with lift forks or the like of a lift truck to allow very accurate positioning of ordnance and the like for attachment to aircraft is discussed. The adapter comprises a base which is supported or secured to the lift forks and includes an ordnance load carrying cradle carried on a trolley mechanism that allows degrees of freedom in the fore/aft and lateral directions. Author (GRA)

N84-33422*# General Dynamics/Convair, San Diego, Calif.
DESIGN STUDY OF TEST MODELS OF MANEUVERING AIRCRAFT CONFIGURATIONS FOR THE NATIONAL TRANSONIC FACILITY (NTF)
S. A. Griffin, A. P. Madsen, and A.A. McClain Washington NASA Aug. 1984 283 p refs Prepared in cooperation with General Dynamics/Convair, Fort Worth, Tex.
(Contract NAS1-16848)
(NASA-CR-3827; NAS 1.26:3827) Avail: NTIS HC A13/MF A01 CSCL 14B

The feasibility of designing advanced technology, highly maneuverable, fighter aircraft models to achieve full scale Reynolds number in the National Transonic Facility (NTF) is examined. Each of the selected configurations are tested for aeroelastic effects through the use of force and pressure data. A review of materials and material processes is also included. M.A.C.

N84-33423# Committee on Science and Technology (U. S. House).
AIRPORT SAFETY TECHNOLOGY: WASHINGTON NATIONAL AIRPORT
Washington GPO 1984 144 p refs Hearing before the Subcomm. on Transportation, Aviation and Mater. of the Comm. on Sci. and Technol., 98th Congr., 2d Sess., no. 76, 21 Mar. 1984
(GPO-34-406) Avail: Subcommittee on Transportation, Aviation and Materials

A Congressional Report containing testimony concerning safety conditions at National Airport in Washington, D.C. is presented. National airport safety can be improved by realigning the northern approach and by upgrading the minimum safe altitude warning system. The Federal Aviation Administration (FAA) has adopted the recommendation that the aircraft must maintain a 720 foot altitude till they are beyond Rosslyn. The FAA also recommends a shift of the Localizer Directional Aid (LDA) approach course and to create a second LDA with an inbound course coinciding with the inbound course of the runway 18 approach. Airport safety procedures are discussed in detail, as well as airport certification, physical condition, and runway safety measures. The effectiveness of the certification program is discussed. S.B.

N84-33424# Naval Coastal Systems Center, Panama City, Fla.
COMPENDIUM OF US INCOMPRESSIBLE FLOW FACILITIES
A. F. Lehman (Lehman (A. F.) Associates, Inc., Centerpoint, N.Y.) and D. C. Summey May 1984 378 p
(AD-A143650) Avail: NTIS HC A17/MF A01 CSCL 14/2

This compendium describes the physical characteristics and performance capability of each facility. Included are subsonic wind tunnels, water tunnels, towing tanks, rotating arms, maneuvering and seakeeping basins, channels, and flumes, anechoic flow facilities, and buoyancy propelled facilities. The information contained in this document will be valuable during the design and testing of applicable hydrodynamic and aerodynamic vehicles. GRA

N84-33370# Joint Publications Research Service, Arlington, Va.
AEROPROYEKT INSTITUTE'S WORK IN AVIATION FACILITY DESIGN
V. Ivanov *In its* USSR Rept.: Transportation (JPRS-UTR-84-026) 18 Sep. 1984 p 11-14 Transl. into ENGLISH from Vozdushnyy Transport (Moscow), 31 Jul. 1984 p 3 (For primary document see N84-33368 23-01)
Avail: NTIS HC A05/MF A01

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N84-33425# Committee on Science and Technology (U. S. House).
SPACE ACTIVITIES OF THE UNITED STATES, SOVIET UNION, AND OTHER LAUNCHING COUNTRIES/ORGANIZATIONS, 1957-1983
Washington GPO 1984 157 p refs Rept. presented by the Subcomm. on Space Sci. and Appl. of the Comm. on Sci. and Technol., 98th Congr., 2nd Sess., Apr. 1984 Prepared by Library

of Congress, Congressional Research Service
(GPO-33-265) Avail: Subcommittee on Space Science and Applications

A history of manned and unmanned spaceflight of the United States and the Soviet Union between 1957 and 1983 is given. A brief background of World War 2 rocketry and the activities of Sputnik and Vanguard are looked at. Then early manned spaceflight is described, along with first and second generation space stations. Space application flights are described, along with Space science programs, military space activities, supporting resources for space flight, and future directions for both US & Soviet space programs. Also discussed are space activities of other launching countries/organizations, including China, the European Space Agency, India, and Japan. S.B.

N84-33426# RAND Corp., Santa Monica, Calif.
OVERVIEW: TECHNIQUES FOR THE ANALYSIS OF SPECTRAL AND ORBITAL CONGESTION IN SPACE SYSTEMS
A. L. Hiebert and W. Sollfrey Mar. 1984 14 p
(AD-A143973; RAND/P-6966) Avail: NTIS HC A02/MF A01 CSCL 22/1

Future growth in commercial and military space systems is constrained by technical problems associated with the frequency spectrum, by orbital congestion, and by costs stemming from proliferated terminals. The authors outline an Air Force sponsored research project to design and develop a capability for predicting and analyzing the spectrum/orbital geometry requirements of current projected U.S. and international space-related systems. The two essential components of the project are a comprehensive space environment data base and a computer analysis program. In combination, they will provide a resource for evaluating engineering and architectural designs, identifying and analyzing the impact of intentional and unintentional electromagnetic interference, and predicting probable saturation conditions in spectrum usage and satellite/orbital positions. The projected capabilities could provide an essential national resource for management decision making and architectural planning on space-related programs. The U.S. Air Force Space Division is establishing a continuing project to utilize these capabilities.
Author (GRA)

N84-33427# Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany). Dept. for Advanced Systems.
DETAILED SYSTEM STUDIES ON RENDEZVOUS AND DOCKING Final Report
P. Natenbruk, A. Getzschmann, R. Burkert, and U. Westerholt Paris ESA Nov. 1983 99 p refs
(Contract ESA-5390/83/NL-BI(SC))
(ERNO-RX-015-2/83; ESA-CR(P)-1885) Avail: NTIS HC A05/MF A01

A low Earth orbit (LEO) mission was used to analyze operational modes associated with the Rendezvous and Docking (RVD) process between two unmanned spacecraft. The mission is defined in its nominal rundown as well as with contingency cases, in terms of the chaser's on-board initiated operations and possible involvement of ground control. The operational modes and their mechanization aboard are presented; associated software structuring and data processing requirements are established. Author (ESA)

N84-33428# MATRA Espace, Paris-Velizy (France). Espace Produits et Technologie.
DETAILED SYSTEM STUDIES ON RENDEZVOUS AND DOCKING. PART 1: EXECUTIVE SUMMARY Final Report
B. Claudinon, A. Ayoun, J. L. Lacombe, P. Lebouar, and G. Mace Dec. 1983 56 p refs
(Contract ESA-5389/83)
(ESA-CR(P)-1894-Pt-1) Avail: NTIS HC A04/MF A01

The overall software required for a rendezvous and docking (RVD) mission was identified. Work to be performed for implementing this software was defined. Requirements on the on-board hardware were refined. A model mission was chosen after analysis of the operation concepts for RVD in low Earth orbit, geostationnary orbit and geostationnary transfer orbit. For this model mission, a detailed implementation of: RVD operations initiation and sequencing; guidance control system function; and docking/undocking control functions was performed. Ground and on-board software architecture, size evaluation and computer loadings are outlined. A development plan for operations and control functions software is proposed. Author (ESA)

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N84-33429# MATRA Service Aerodynamique, Toulouse (France). Dept. d'Etudes et Avant Projets Systeme.
STUDY ON THE PERTURBATION OF LUNAR AND PLANETARY ORBITERS Final Report
M. Haziza and E. Zeis Paris ESA Nov. 1983 96 p refs
(Contract ESOC-5219/82/D-JS(SC))
(MATRA-CMT-RT005; ESA-CR(P)-1886) Avail: NTIS HC A05/MF A01

A first order analytical orbit prediction software based on the stroboscopic method with equinoctial elements was developed. Only conservative disturbing forces are considered: the non-sphericity of the central body and the third body attraction. The first order equations of motion are analytically integrated over one revolution with a MACSYMA computerized algebraic utility. The obtained FORTRAN expressions are the foundations of the first version of the software which may be applied to the prediction of the orbit of lunar and planetary orbiters. Author (ESA)

N84-33430# Hatfield Polytechnic (England). Numerical Optimization Center.
LOW THRUST ORBIT OPTIMIZATION FOR INTERPLANETARY MISSIONS, VOLUME 1
L. C. W. Dixon, S. E. Hersom, and Z. A. Maany Paris ESA Dec. 1983 117 p refs 2 Vol.
(Contract ESA-4774/81/D-JS(SC))
(ESA-CR(P)-1904-Vol-1) Avail: NTIS HC A06/MF A01

The optimization of satellite orbits between the Earth and an asteroid when the satellite is powered by a low thrust ion drive or solar power unit was studied. It was assumed that the satellite is launched by an Ariane type launch vehicle. A hybrid Pontryagin/recursive quadratic programming approach was used. The software was developed on DEC System-10 computer and implemented on the ESOC Siemens 7865 Computer System. Results for 13 mission simulations are discussed. Author (ESA)

N84-33431# Hatfield Polytechnic (England). Numerical Optimization Center.
LOW THRUST ORBIT OPTIMIZATION FOR INTERPLANETARY MISSIONS, VOLUME 2
S. E. Hersom and Z. A. Maany Paris ESA Dec. 1983 84 p 2 Vol.
(Contract ESA-4774/81/D-JS(SC))
(ESA-CR(P)-1904-Vol-2) Avail: NTIS HC A05/MF A01

The optimization of satellite orbits between the Earth and an asteroid when the satellite is powered by a low thrust ion drive or solar power unit was studied. It is assumed that the satellite is launched by an Ariane type launch vehicle. A hybrid Pontryagin/recursive quadratic programming approach was used. The software was developed on DEC System-10 computer and implemented on the ESOC Siemens 7865 Computer System. Results for 13 mission simulations are discussed. Author (ESA)

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air).*

N84-33432*# Essex Corp., Huntsville, Ala.
ANALYSIS AND SELECTION OF A REMOTE DOCKING SIMULATION VISUAL DISPLAY SYSTEM Final Report, May 1983 - Aug. 1984
Nicholas Shields, Jr. and Mary Frances Fagg Aug. 1984 38 p refs
(Contract NAS8-35473)
(NASA-CR-171148; NAS 1.26:171148; H-84-04) Avail: NTIS HC A03/MF A01 CSCL 14B

The development of a remote docking simulation visual display system is examined. Video system and operator performance are discussed as well as operator command and control requirements and a design analysis of the reconfigurable work station. M.A.C.

N84-33433*# Essex Corp., Huntsville, Ala.
DEVELOPMENT OF ROBOTICS FACILITY DOCKING TEST HARDWARE Final Report
Tomas E. Loughead and Roger V. Winkler 31 Aug. 1984 106 p
(Contract NAS8-34656)
(NASA-CR-171153; NAS 1.26:171153; H-84-05) Avail: NTIS HC A06/MF A01 CSCL 14B

Design and fabricate test hardware for NASA's George C. Marshall Space Flight Center (MSFC) are reported. A docking device conceptually developed was fabricated, and two docking targets which provide high and low mass docking loads were required and were represented by an aft 61.0 cm section of a Hubble space telescope (ST) mockup and an upgrading of an existing multimission modular spacecraft (MSS) mockup respectively. A test plan is developed for testing the hardware. E.A.K.

N84-33434*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
ADVANCED X-RAY ASTROPHYSICS FACILITY (AXAF) Quarterly Progress Report, May 1982 - Mar. 1984
Mar. 1984 5 p
(Contract NAS8-32667)
(NASA-CR-171156; NAS 1.26:171156; SA08-32667) Avail: NTIS HC A02/MF A01 CSCL 14B

The progress of the Advanced X-ray Astrophysics Facility is summarized. A design review of the facility, hardware development, cost analysis, and listings of published reports are examined. M.A.C.

N84-33435# Massachusetts Inst. of Tech., Cambridge.
ELECTROMAGNETIC LAUNCHERS AND GUNS, PHASE 1 Final Report, Nov. 1979 - May 1980
H. Kolm and R. Miller Jun. 1980 137 p
(Contract DAAK10-79-C-0384)
(AD-A143778) Avail: NTIS HC A07/MF A01 CSCL 01/5

During the first six months (phase one) the group constructed a 65 kJ, 6 kV fast discharge capacitor bank, a 134 kJ, 900 V slow discharge bank, and a 245 kJ, 350 V mobile bank for field launching was started. Also completed was an accelerator test bench and a protected control and observation room instrumented with digital data processing equipment. Studies have been initiated on three acceleration mechanisms, and on the theoretical limitations in general. A helical railgun (brush-commutated helical accelerator) was bench-tested to 500 gee acceleration and 30 m/s velocity achieved over a 12 inch section. A 20 foot, twin helix launcher and optimized cargo or reconnaissance glider were designed, for construction during phase two. Mass driver (discrete-coil, synchronous accelerator) coils were tested to destruction over a range of pulse conditions to gain an understanding of failure modes and develop improved designs for different ranges of operation. A momentum transformer has been constructed for transferring momentum from a pneumatically driven sabot to a smaller projectile. Theoretical studies indicate that the smallest vehicle capable of surviving a ground-based launch to Earth escape velocity at reasonable atmospheric losses of mass and energy is a 25 kg, 6 cm caliber cylinder. GRA

N84-33436# Department of the Air Force, Washington, D.C.
SHOCK ABSORBING MISSILE LAUNCH PAD Patent Application
G. E. Rudd, inventor (to Air Force) Filed 29 May 1984 45 p
(AD-D011173; US-Patent-Appl-SN-614905) Avail: NTIS HC A03/MF A01 CSCL 06/1

Shock absorbing missile launch pad for Mx type missiles having molded ethylene propylene diene terpolymer composition. Pad has curved resilient rubber pad with a Teflon-fiberglass laminate bonded to outer convex surface thereof, and has a support plate bonded to the inner concave surface thereof. Springs are provided to urge pad away from missile at launch to prevent damage to missile. Author (GRA)

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N84-33437*# National Aeronautics and Space Administration, Washington, D. C.
SPACE STATION PROGRAM DESCRIPTION DOCUMENT, Books 1-7 Final Edition, May 1982 - Apr. 1984
Mar. 1984 762 p
(NASA-TM-86652-Bk-1-7; NAS 1.15:86652-Bk-1-7) Avail: NTIS HC A99/MF A01 CSCL 22B

The Space Station Program Description Document is summarized. The six volumes include: (1) introduction and summary; (2) mission description; (3) systems requirements and characteristics; (4) advanced development; (6) system operations; and (7) program plan. Volume 5 was deleted as a separate book. For individual titles, see N84-33438 through N84-33443.

N84-33438*# National Aeronautics and Space Administration, Washington, D. C.
SPACE STATION PROGRAM DESCRIPTION DOCUMENT: INTRODUCTION AND SUMMARY, Book 1
In its Space Station Program Description Document Mar. 1984 99 p (For primary document see N84-33437 23-15)
(NASA-TM-86652-Bk-1; NAS 1.15:86652-Bk-1) Avail: NTIS HC A99/MF A01 CSCL 22B

Space Station historical perspective; time-phased mission set; mission requirements; user concerns and NASA challenges; system requirements; generic technology base; candidate system architecture; design considerations; operational requirements; program management and procurement approach are discussed. B.G.

N84-33439*# National Aeronautics and Space Administration, Washington, D. C.
MISSION DESCRIPTION DOCUMENT, Book 2
In its Space Station Program Description Document Mar. 1984 175 p (For primary document see N84-33437 23-15)
(NASA-TM-86652-Bk-2; NAS 1.15:86652-Bk-2)Avail: NTIS HC A99/MF A01 CSCL 22B

Realistic science and applications, commercial, and technology development missions appropriate to the Space Station program are identified. Time-phased mission requirements synthesized from the various industry studies and the results from in-house studies are established. Author

N84-33440*# National Aeronautics and Space Administration, Washington, D. C.
SYSTEM REQUIREMENTS AND CHARACTERISTICS, Book 3

In its Space Station Program Description Document Mar. 1984 193 p (For primary document see N84-33437 23-15)
(NASA-TM-86652-Bk-3; NAS 1.15:86652-Bk-3) Avail: NTIS HC A99/MF A01 CSCL 22B

The Space Station configuration concepts, architecture, and system requirements as driven by the missions were developed. The requirements address both missions that are carried out on-board the Station and missions that are supported from the Space Station. Author

N84-33441*# National Aeronautics and Space Administration, Washington, D. C.
ADVANCED DEVELOPMENT PROGRAM, Book 4 and 5
In its Space Station Program Description Document Mar. 1984 74 p (For primary document see N84-33437 23-15)
(NASA-TM-86652-Bk-4/5; NAS 1.15:86652-Bk-4/5) Avail: NTIS HC A99/MF A01 CSCL 22B

The technology and advanced development programs required to support the Space Station are outlined. The technology program identifies the key technology options that have the potential for enhancing the desired operational Space Station. The advanced development program provides the means of advancing selected technologies and demonstrating feasibility and performance before implementing into the Space Station design. The program is designed to support the initial Space Station and the evolutionary growth capability. Author

N84-33442*# National Aeronautics and Space Administration, Washington, D. C.
SYSTEM OPERATIONS, Book 6
In its Space Station Program Description Document Mar. 1984 175 p (For primary document see N84-33437 23-15)
(NASA-TM-86652-Bk-6; NAS 1.15:86652-Bk-6) Avail: NTIS HC A99/MF A01 CSCL 22B

The operational philosophies developed and the operational requirements necessary to satisfy the missions outlined in Book 2 are addressed. Author

N84-33443*# National Aeronautics and Space Administration, Washington, D. C.
PROGRAM PLAN, Book 7
In its Space Station Program Description Document Mar. 1984 46 p (For primary document see N84-33437 23-15)
(NASA-TM-86652-Bk-7; NAS 1.15:86652-Bk-7) Avail: NTIS HC A99/MF A01 CSCL 22B

The program planning and objectives are defined, and the overall management, technical, and procurement approaches are described. Author

N84-33444# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
SATELLITE TELEMETRY [TELEMETRIA POR SATELITE]
Jose Roberto deOlveira Aug. 1983 15 p refs In PORTUGUESE Presented at the 5th Simposio Brasileiro de Hidrologia e Recursos Hidricos, Blumenau, 13-18 Nov. 1983
(INPE-2854-PRE/394) Avail: NTIS HC A02/MF A01

Hydrologic application of satellite data collection systems in Brazil is discussed. The Data Collection Platform (DCP) is a telemetry station used for the acquisition of environmental parameters. Artificial satellites are employed to relay the data to receiving centers. Two meteorologic satellite data collection systems are in operation in Brazil: the ARGOS system, on board low-orbit (850 km) satellites of the TIROS-NOAA series, and the Geostationary Operational Satellite (GOES) system, on board geostationary satellites (36,000 km) of the SMS/GOES series. DCPs have been used mainly in the field of hydrology to obtain timely data, to make decisions, and to compose historical records. The first DCP network established in Brazil was in the Tocantins Basin, which has 10 telemetry stations. Other networks are currently being planned. Prototypes of ARGOS and GOES DCPs are being developed that are aimed at further industrialization and improved supply of national demand. Transl. by B.G.

N84-33445# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
ARTIFICIAL SATELLITES, ORBITAL MOTION [SATELITE ARTIFICIAL-MOVIMENTO ORBITAL]
Wilson Custodio Canesin daSilva and Luiz Danilo Damasceno Ferreira Jul. 1984 123 p refs In PORTUGUESE; ENGLISH summary
(INPE-3163-RPE/458) Avail: NTIS HC A06/MF A01

The modeling and analysis of the principal forces on the satellite for numerical integration are presented. The classical analytical methods of analysis and orbit propagation, such as analytical integration of the Lagrange equations and Brouwer's method are presented. Cases of resonance and libration of the geosynchronous satellites are also presented. Author

N84-33446# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
A SIMULATION OF A SATELLITE POWER SUPPLY SYSTEM M.S. Thesis [SIMULACAO DE UM SISTEMA DE SUPRIMENTO DE ENERGIA DE UM SATELITE]
Jose Paulo deAndrade Filho Jun. 1984 139 p refs in PORTUGUESE: ENGLISH summary
(INPE-3140-TDL/166) Avail: NTIS HC A07/MF A01

A simulation of a typical power supply system for a low orbit and low power consumption satellite is presented. The simulation is based on a digital computer program developed in FORTRAN language. Empirical models are used to represent the elements of the Power Supply System. The results of the simulation are presented as graphics showing the variation of the quantities as the satellite goes around the assumed orbit, and as a table showing the voltages and currents of easy measuring. Author

N84-33447# Naval Postgraduate School, Monterey, Calif.
OPTIMAL DIGITAL CONTROL OF A BANK-TO-TURN MISSILE M.S. Thesis
Carlos Augusto Leal Velloso Mar. 1984 155 p
(AD-A144043) Avail: NTIS HC A08/MF A01 CSCL 01/3

This work addresses the application of digital optimum control theory to a back-to-turn missile. A optimal guidance law has been developed and tested in several scenarios using a 2-D model. Effects of sample rate, pitch angle, gravity and approximations for small and large roll excursions are discussed. GRA

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation, e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

No abstracts in this category.

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications.*

N84-33448# MATRA Espace, Paris-Velizy (France).
TELEMETRY/TELECOMMAND (TM/TC) PROCESSOR STUDY Final Report
J. F. Carrasco 20 Jan. 1984 49 p refs
(Contract ESTEC-5565/83/NL-BS(SC))
(MATRA-144-TM-TC-03-002; ESA-CR(P)-1900) Avail: NTIS HC A03/MF A01

The functions of a telemetry/telecommand (TM/TC) processor for ESA ESGE are established. Functions performed by the TC front end equipment (FEE) include video signal generation, interface with the RF part, telecomand processing interface with the master test processor, self test, and local mode. Functions performed by

the TM FEE include video signal, telemetry processing, interface with the master test processor, self test, and operator interface. Functions common to TC and TM FEE are time management, telecommand monitoring, local recording, and simulation of the operational links. An architecture with two processors is proposed. Author (ESA)

N84-33449# Marconi Space and Defence Systems Ltd., Portsmouth (England) Satellite Division Ground Support Equipment Group.
THE TM/TC PROCESSOR STUDY REPORT
Mar. 1984 64 p
(Contract ESTEC-5564/83/NL-BS(SC))
(BL-5577; ESA-CR(P)-1901) Avail: NTIS HC A04/MF A01

Requirements of a TM/TC Front End Equipment (FEE) for ESA spacecraft, particularly communications spacecraft using conventional and packet command and telemetry systems are specified. Parts necessary to form a comprehensive test system for checking operational spacecraft systems in conjunction with the master test processor and the checkout equipment are described. The use of TM/TC FEE at subsystem integration level, spacecraft system test level and as front end to a ground station operational control center is discussed. A self contained test system, including its digital handling capabilities, microwave measurements, the software, and self checking possibilities were examined. Author (ESA)

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support.* For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics.*

N84-33450* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
CURVED CAP CORRUGATED SHEET Patent
Randall C. Davis, Thomas T. Bales, Dick M. Royster, and L. Robert Jackson, inventors (to NASA) Issued 18 Sep. 1984 11 p Filed 1 Jul. 1983 Supersedes N83-29446 (21 - 18, p 2908)
(NASA-Case-LAR-12884-1; NAS 1;71:LAR-12884-1; US-Patent-4,472,473; US-Patent-Appl-SN-510136; US-Patent-Class-428-184; US-Patent-Class-52-814; US-Patent-Class-428-182; US-Patent-Class-428-595) Avail: US Patent and Trademark Office CSCL 22B

The report describes a structure for a strong, lightweight corrugated sheet. The sheet is planar or curved and includes a plurality of corrugation segments, each segment being comprised of a generally U-shaped corrugation with a part-cylindrical crown and cap strip, and straight side walls and with secondary corrugations oriented at right angles to said side walls. The cap strip is bonded to the crown and the longitudinal edge of said cap strip extends beyond edge at the intersection between said crown and said side walls. The high strength relative to weight of the structure makes it desirable for use in aircraft or spacecraft.
Official Gazette of the U.S. Patent and Trademark Office

N84-33451*# National Aeronautics and Space Administration, Washington, D. C.
INTERACTIONS BETWEEN SATELLITES AND PLASMA
U. Isensee, W. Lehr, and H. Maassberg Jun. 1984 18 p refs Transl. into ENGLISH from Kleinbeubacher Berichte (Darmstadt), v. 22, 1979 p 305-314 Original language document was announced as A79-33728 Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep. by Technische Hochschule, Darmstadt (NASA-TM-77476; NAS 1.15:77476) Avail: NTIS HC A02/MF A01 CSCL 22B

The interactions of a spacecraft with the surrounding, streaming plasma were determined by the following effects: the fade out of the plasma in the wake of the probe, the emission of photoelectrons and secondary electrons, the differential charging of the surface of the probe, and a spatial potential distribution in the vicinity of the space probe. These effects and their importance are discussed and following plasma conditions are considered: (1) geostationary satellite orbits; (2) in the solar wind (HELIOS mission); and (3) in the ionosphere at an altitude of 250 km (the projected OSV on Spacelab). The fundamental models are reviewed. Author

N84-33452*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DESIGN GUIDELINES FOR ASSESSING AND CONTROLLING SPACECRAFT CHARGING EFFECTS
Carolyn K. Purvis, Henry B. Garrett (JPL), A. C. Whittlesey (JPL), and N. John Stevens (Hughes Aircraft Co., El Segundo, Calif.) Sep. 1984 48 p refs
(NASA-TP-2361; E-2073; NAS 1.60:2361) Avail: NTIS HC A03/MF A01 CSCL 22B

The need for uniform criteria, or guidelines, to be used in all phases of spacecraft design is discussed. Guidelines were developed for the control of absolute and differential charging of spacecraft surfaces by the lower energy space charged particle environment. Interior charging due to higher energy particles is not considered. A guide to good design practices for assessing and controlling charging effects is presented. Uniform design practices for all space vehicles are outlined. E.A.K.

N84-33453*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
GALACTIC HEAVY-ION SHIELDING USING ELECTROSTATIC FIELDS
Lawrence W. Townsend Sep. 1984 10 p refs
(NASA-TM-86265; L-14832; NAS 1.15:86265) Avail: NTIS HC A02/MF A01 CSCL 22B

The shielding of spacecraft against galactic heavy ions, particularly high-energy Fe(56) nuclei, by electrostatic fields is analyzed for an arrangement of spherical concentric shells. Vacuum breakdown considerations are found to limit the minimum radii of the spheres to over 100 m. This limitation makes it impractical to use the fields for shielding small spacecraft. The voltages necessary to repel these Fe(56) nuclei exceed present electrostatic generating capabilities by over 2 orders of magnitude and render the concept useless as an alternative to traditional bulk-material shielding methods. Author

N84-33454*# National Aeronautics and Space Administration, Washington, D. C.
SPACE STATIONS: LIVING IN ZERO GRAVITY, DEVELOPMENTAL TASK FOR PSYCHOLOGISTS AND SPACE ENVIRONMENTAL EXPERTS
Eberhard Ludwig Sep. 1984 10 p Transl. into ENGLISH from Umschau (West Germany), no. 18, 1984 p 526-527
(NASA-TM-77620; NAS 1.15:77620) Copyright. Avail: NTIS HC A02/MF A01 CSCL 22B

The recent advances in the psychological aspects of space station design are discussed, including the impact of the increase in awareness of both the public in general as well as space environmental experts of the importance of psychological factors when designing space stations and training astronauts. Author

N84-33455*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
A REVIEW OF MICROMETEOROID FLUX MEASUREMENTS AND MODELS FOR LOW ORBITAL ALTITUDES OF THE SPACE STATION
Michael Susko Sep. 1984 27 p refs
(NASA-TM-86466; NAS 1.15:86466) Avail: NTIS HC A03/MF A01 CSCL 22B

A review of meteoroid flux measurements and models for low orbital altitudes of the Space Station has been made in order to provide information that may be useful in design studies and laboratory hypervelocity impact tests which simulate mi-

crometeoroids in space for design of the main wall of the Space Station. This report deals with the meteoroid flux mass model, the defocusing and shielding factors that affect the model, the probability of meteoroid penetration of the main wall of a Space Station. Whipple (1947) suggested a meteoroid bumper, a thin shield around the spacecraft at some distance from the wall, as an effective device for reducing penetration, which has been discussed in this report. The equations of the probability of meteoroid penetration, the average annual cumulative total flux, and the equations for the thickness of the main wall and the bumper are presented in this report. B.W.

N84-33456 Virginia Polytechnic Inst. and State Univ., Blacksburg.
SPACE STATION M.A. Thesis
Jane Carter Jul. 1984 42 p
Avail: NTIS HC A03/MF A01

The disciplines of architecture are used to combine and coordinate space structures and human factors engineering to create a liveable space station environment in which recognizable components keep the man-made space from totally alienating the human occupant. A space station comprising a three-part module that is 14' in diameter with segments that are 9' 2' on center is considered. Three alternatives for orientation within a cylinder are examined. Life support systems, purpose of task, and psychological and spiritual concerns are addressed. A.R.H.

N84-33457# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
OPTIMIZING PARAMETERS AND CONTROLS FOR MANEUVERING FLEXIBLE STRUCTURES Ph.D. Thesis - Illinois Univ., Urbana-Champaign
Ronald J. Lisowski 1984 92 p
(AD-A143726; AFIT/CI/NR-84-1) Avail: NTIS HC A05/MF A01 CSCL 12/1

The combined problem of optimizing both the parameters and the control for maneuvering flexible structures is addressed. The necessary conditions for the general problem are defined and a numerical technique for the solution is discussed. Implementing the numerical solutions is shown to be practical using reduced-order structural models. Optimal controls are smoothed by including control derivative penalties in order to allow terminal values for the controls to be specified. The optimization leads to the investigation of structures that require only simple rigid body controls for accomplishing the maneuver while ensuring minimal modal excitation at the maneuver's completion. Numerical examples are presented for single axis slew maneuvers of a symmetric four boom flexible structure. Author (GRA)

N84-33458# Lockheed Missiles and Space Co., Sunnyvale, Calif.
ACOSS TWELVE (ACTIVE CONTROL OF SPACE STRUCTURES) Final Technical Report, Sep. 1981 - May 1982
J. N. Auburn, J. A. Breakwell, N. K. Gupta, and M. G. Lyons Griffiss AFB, N.Y. RADC Feb. 1984 255 p
(Contract F30602-81-C-0260; ARPA Order 3654)
(AD-A143829; LMSC-D883023; RADC-TR-84-28) Avail: NTIS HC A12/MF A01 CSCL 22/2

The theory of steady state and broad band random disturbance rejection for large space structures is developed and tested analytically on a complex optical strawman configuration. It is shown that active control is potentially feasible for micro-vibration stabilization of precision large structures. A number of brassboard experiments have been carried out to illustrate the theory and to address implementation and mechanization of active control systems with both analog and digital approaches. Author (GRA)

N84-33459# Aeritalia S.p.A., Torino (Italy). Settore Spazio.
HEAT REJECTION SYSTEM TECHNOLOGY DEMONSTRATION MODEL Final Report
L. Bussolino Nov. 1983 190 p refs
(Contract ESTEC-4493/80/NL-AK(SC))
(TD-RP-AI-004; ESA-CR(P)-1891) Avail: NTIS HC A09/MF A01

A heat rejection system technology demonstration model representative of a fluid loop radiator system to be used for environmental control of advanced spacecraft and/or payload was designed. Thermal, hydraulic, structural, manufacturing, and system control software aspects were studied. Radiator panel manufacture and acceptance tests; bypass and flow metering valve design, manufacture and development tests; electronic control unit manufacture and development tests together with its software design, coding and acceptance tests; and fluid loop components procurement are summarized. Author (ESA)

N84-33460# European Space Research and Technology Center, Noordwijk (Netherlands).
THE SPACELAB FLIGHT UNIT OFFGASSING TEST
M. Debeir, M. D. Judd, and J. Meehan Paris ESA May 1984 34 p refs
(ESA-STM-232; ISSN-0379-4075) Avail: NTIS HC A03/MF A01

The Spacelab flight unit offgassing test procedures and results are described. Up to 22 different potentially toxic volatile compounds were detected in the avionics air loop and 20 in the cabin air loop. The high sensitivity of the analytical method permits the identification of compounds down to the microgram/cum level. Comparison of contaminant concentrations with the corresponding specifications as identified in NHB 8060.1B, shows quite clearly that the contaminant levels are all several orders of magnitude lower than specified. Author (ESA)

N84-33658# Joint Publications Research Service, Arlington, Va.
STAND ON SPACE STATION PARTICIPATION TO BE SURVEYED
In its Worldwide Rept.: Telecommun. Policy, Res. and Develop. 26 Sep. 1984 p 20-21 Repr. from The Toronto Star (Toronto), 25 Jul. 1984 p A19 (For primary document see N84-33657 23-32)
Avail: NTIS HC A05/MF A01

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography.*

N84-33461*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
INDUCED ENVIRONMENT CONTAMINATION MONITOR: PRELIMINARY RESULTS FROM THE SPACELAB 1 FLIGHT
E. R. Miller, ed. Aug. 1984 45 p refs
(NASA-TM-86461; NAS 1.15:86461) Avail: NTIS HC A03/MF A01 CSCL 14B

The STS-9/Induced Environment Contamination Monitor (IECM) mission is briefly described. Preliminary results and analyses are given for each of the 10 instruments comprising the IECM. The final section presents a summary of the major results. Author

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N84-33462*# Rocket Research Corp., Redmond, Wash.
RADIATIVE RESISTOJET PERFORMANCE CHARACTERIZATION TESTS Final Report
C. I. Miyake Sep. 1984 55 p refs
(Contract NAS3-23868)
(NASA-CR-174763; NAS 1.26:174763; Rept-84-R-958) Avail: NTIS HC A04/MF A01 CSCL 21H

The test article, test approach, data analysis and results of a study undertaken to characterize performance of the augmentation section of the Rocket Research Company Augmented Catalytic Thruster as a gas resistojet using hydrogen, nitrogen and ammonia

as propellants are described. This renewed interest in resistojets is a result of propulsion systems definition studies which indicate potential application to space station auxiliary propulsion. Author

N84-33463*# Honeywell, Inc., Minneapolis, Minn. Solid State Electronics Div.
RESEARCH PRESSURE INSTRUMENTATION FOR NASA SPACE SHUTTLE MAIN ENGINE Monthly Report
P. J. Anderson, P. Nussbaum, and G. Gustafson Aug. 1984 55 p
(Contract NAS8-34769)
(NASA-CR-173932; NAS 1.26:173932) Avail: NTIS HC A04/MF A01 CSCL 21H

The development of prototype pressure transducers which are targeted to meet the Space Shuttle Main Engine SSME performance design goals is discussed. The fabrication, testing and delivery of 10 prototype units is examined. Silicon piezoresistive strain sensing technology is used to achieve the objectives of advanced state-of-the-art pressure sensors in terms of reliability, accuracy and ease of manufacture. Integration of multiple functions on a single chip is the key attribute of this technology. M.A.C.

N84-33464# Messerschmitt-Boelkow-Blohm G.m.b.H., Lampoldshausen (West Germany). Space Div.
EXPLORATORY TESTING OF THE MBB 10 N BIPROPELLANT ENGINE. VOLUME 2: PRELIMINARY EXHAUST PLUME INVESTIGATIONS Executive Summary
H. Spegele and Hauke Trinks (Hochschule der Bundeswehr, Hamburg) 16 Apr. 1982 81 p refs 2 Vol.
(Contract ESTEC-3273/77/NL-AK)
(MBB-UR-561/82-Vol-2; ESA-CR(P)-1898-Vol-2) Avail: NTIS HC A05/MF A01

The contaminants and their distributions in the exhaust plume of a MBB 10 N bipropellant thruster were investigated during pulse mode firings. The principal contaminant is monomethylhydrazine nitrate, a condensate of the combustion product. Design parameters affecting pulse performance and life capability are the injector manifold volume and injector/combustion chamber compatibility. Thruster pulse duration strongly influences performance and contamination rate due to incomplete combustion during ignition and shutdown phases. Condenseous reaction products in the plume can cause strong electrostatic charges. Propellant impurities have a direct impact on the erosive and abrasive effect of the thruster exhaust plume within a cone of 10 deg half cone angle from the nozzle center line. Author (ESA)

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N84-33465# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
MATERIALS SUBSTITUTION AND RECYCLING
Loughton, England Apr. 1984 298 p refs In ENGLISH and FRENCH Meeting held in Vimeiro, Portugal, 14-19 Oct. 1983
(AGARD-CP-356; ISBN-92-835-0352-X) Avail: NTIS HC A13/MF A01

The rarity of several metals such as cobalt, chromium, tantalum and niobium, which are used in high temperature materials for jet turbine induces a need for stock-piling, conservation, substitution and recycling. This meeting was focused on the last two aspects, with special reference to superalloys with low critical element contents and substitutes to superalloys on one side, the identification of the sensitive impurities, the problems related to the increase of their concentration, and the possible ways to solve them on the other. For individual titles, see N84-33466 through N84-33488.

N84-33466# Rutgers - The State Univ., Piscataway, N. J. Center for Ceramic Research.
THE NATURE OF THE CRITICAL AND STRATEGIC MATERIALS PROBLEM
John B. Wachtman, Jr. *In* AGARD Mater. Substitution and Recycling Apr. 1984 11 p refs (For primary document see N84-33465 23-23)
Copyright. Avail: NTIS HC A13/MF A01

The economics and national defense systems of the industrialized, market economy countries depend on many imported raw materials. Some of these materials are vital to the performance of advanced weapons or to basic production capacity such as machine tools. While no present shortage exists, the potential of supply interruptions requires national preparedness as a form of insurance. Adequate preparedness requires a multifaceted strategy including the capability of short term response, such as stockpiling, and longer term responses such as emergency substitution. Development of substitutes occurs normally only when a price or performance advantage is foreseen. Some substitutes are being developed through this natural economic motivation exists. Technically promising substitution development which could reduce vulnerability may require more deliberate and better organized government support. Author

N84-33467# Durham Univ. (England). Dept. of Geography.
FACTORS AFFECTING THE SUPPLY OF STRATEGIC RAW MATERIALS WITH PARTICULAR REFERENCE TO THE AEROSPACE MANUFACTURING INDUSTRY
E. W. Anderson *In* AGARD Mater. Substitution and Recycling Apr. 1984 20 p refs (For primary document see N84-33465 23-23)
Copyright. Avail: NTIS HC A13/MF A01

The political and strategic factors affecting the supply of certain raw materials critical to the European NATO aerospace industry are analyzed. For various reasons, including potential political instability, concentration of sources, small scale of production and technological industrial problems, chromium, cobalt, hafnium, manganese, niobium, titanium, tungsten and vanadium are all considered to a degree at risk. R.J.F.

N84-33468# Motoren- und Turbinen-Union Muenchen G.m.b.H. (West Germany).
MEASURES FOR MATERIALS CONSERVATION IN AERO-ENGINE CONSTRUCTION c07
H. Huff, R. Graeter, and R. Froehling *In* AGARD Mater. Substitution and Recycling Apr. 1984 9 p (For primary document see N84-33465 23-23)
Copyright. Avail: NTIS HC A13/MF A01

Based on the minimization of critical raw materials input the production of as little scrap (machining wastes, parts out of service) as possible, concepts for reducing the use of materials and the associated dependence upon raw materials imports are explained. With reference to aeroengine components, the following possibilities are shown as examples: Very different materials can be combined by means of modern joining techniques. Components built up in this way contain expensive materials only where they are indispensable. The blank contour can be approximated to the final contour of the component (thus reducing machining losses) by contour forging, flow turning and powder metallurgy. Run parts can be reusable. It is shown that a considerable economy of materials is obtainable and has partly been achieved already. Attention is drawn to problems which may follow from the application; e.g., material deposition or joining of dissimilar materials results in a tendency to render the recycling of such engine components more difficult. R.J.F.

N84-33469# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Stuttgart (West Germany).
TOWARDS A CYCLE WITHOUT LOSS: COBALT IN THE AIRCRAFT INDUSTRY c26
C. Voigt *In* AGARD Mater. Substitution and Recycling Apr. 1984 7 p refs (For primary document see N84-33465 23-23)
Copyright. Avail: NTIS HC A13/MF A01

The flow cycle of cobalt in products used in the aircraft industry was investigated. The manufacturing processes, uses and

ultimate destinations of the materials containing cobalt (superalloys, ultrahigh strength steels, tool steels and special alloys) were quantitatively analyzed. The ways in which cobalt is lost within the material cycle were determined. Cobalt recovery rates for process scrap and obsolete scrap are presented. It turns out that, ultimately, the dilution of cobalt in iron is to a degree that it is improved scrap separation at all steps of the material cycle. The influence of no scrap technologies is discussed. R.J.F.

N84-33470# General Electric Co., Cincinnati, Ohio. Engineering Materials Technology Labs.

GAS TURBINE ENGINE DESIGN CONSIDERATIONS AS RELATED TO ALLOYS OF HIGH CRITICAL ELEMENT CONTENT c07

Robert A. Sprague *In* AGARD Mater. Substitution and Recycling Apr. 1984 6 p (For primary document see N84-33465 23-23)

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The trade offs that a designer must make in the selection of materials for specific component applications are reviewed. Emphasis is placed on discussion of what options are available in reducing the strategic material content of the engine system while still achieving performance and cost objectives. The primary payoff is selection of wrought/cast alloys containing strategic elements is performance, not cost. For example, in commercial engines, the temperatures that parts are exposed to have increased steadily in an effort to improve specific fuel consumption. In military engines, higher operating temperatures are usually governed by efforts to improve thrust to weight ratio. R.J.F.

N84-33471*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

UNDERSTANDING THE ROLES OF THE STRATEGIC ELEMENT COBALT IN NICKEL BASE SUPERALLOYS c26

Joseph B. Stephens and Robert L. Dreshfield *In* AGARD Mater. Substitution and Recycling Apr. 1984 15 p refs (For primary document see N84-33465 23-23)

Copyright. Avail: NTIS HC A13/MF A01

Research progress in understanding the effects of cobalt and some possible substitute on microstructure, mechanical properties, and environmental resistance of turbine alloys is discussed. The United States imports over 90 percent of its cobalt, chromium, tantalum and columbium, all key elements in high temperature nickel base superalloys for aircraft gas turbine disks and airfoils. NASA, through joint government/industry/university teams, undertook a long range research program aimed at reducing or eliminating these strategic elements by examining their basic roles in superalloys and identifying viable substitutes. R.J.F.

N84-33472# Wiggin Alloys Ltd., Hereford (England).

OXIDE DISPERSION STRENGTHENED ALLOYS c26

G. A. J. Hack *In* AGARD Mater. Substitution and Recycling Apr. 1984 16 p refs (For primary document see N84-33465 23-23)

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The principle of oxide dispersion strengthening was applied to precious metals, nickel, ferritic steels, aluminum alloys and superalloys. Conventional melting processes are unsuitable for the production of ODS alloys and alternative methods are required to incorporate oxides, etc., various base compositions. One of these methods, mechanical alloying is particularly appropriate to large scale commercialization and readily accommodate reactive alloying elements. The commercial production, properties and applications of ODS superalloys are described. The strength contribution of the oxides gives the alloy designer more freedom to optimize for oxidation and sulphidation resistance to minimize the use of strategic metals; for example, the alloys described are all cobalt free. R.J.F.

N84-33473# Vanderbilt Univ., Nashville, Tenn. Dept. of Metallurgy and Management of Technology.

SUBSTITUTION AND CONSERVATION TECHNOLOGY FOR CHROMIUM c26

Allen G. Gray *In* AGARD Mater. Substitution and Recycling Apr. 1984 11 p (For primary document see N84-33465 23-23)

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Information is given on application areas where substitution conservation appear feasible in a supply crisis based on present available technology. Likewise, applications where research is needed to expand the substitution potential are indicated. Opportunities for conservation and displacement with emerging technologies are discussed. Finally, the value of an organized effort on substitution preparedness to gather and develop information on chromium substitution and conservation technology and have it ready as a contingency plan are presented. Chromium is a highly strategic and critical metal because of its significant import dependence and its essential uses for defense, energy and industrial products. It is used in such diversified applications as stainless steels and tool steels; alloy steels to provide hardenability in heat treatment, in air frames, and in landing heat and corrosion resistant alloys; superalloys for jet engines; alloy cast iron; electroplating; and corrosion treatment for aluminum alloys. R.J.F.

N84-33474# National Physical Lab., Teddington (England).

POTENTIAL OF METAL-MATRIX COMPOSITES AS SUPERALLOY SUBSTITUTES c26

M. McLean and T. Khan (ONERA) *In* AGARD Mater. Substitution and Recycling Apr. 1984 10 p refs (For primary document see N84-33465 23-23)

Copyright. Avail: NTIS HC A13/MF A01

A review of metal-matrix composites for high temperature applications was made in order to identify materials that are insensitive to the supply of critical elements. The potential of metal-matrix composites as gas-turbine blade materials was largely judged on the increased temperature capabilities they offer over the strongest current superalloys. However, several composites that were rejected on this basis are either independent of or have low concentrations of critical alloying elements. Consequently they should be reassessed as reserve materials matching the performance of existing widely used superalloys that depend on strategically vulnerable constituents. An alternative approach might be to consider the potential of regenerating the original creep performance of certain monocarbide reinforced nickel based composites such as Cotac 744 developed at ONERA - after service exposure. In this context the combination of perfectly elastic fibers in a creeping matrix would imply that high temperature deformation of these materials is almost completely recoverable. Hence, one should judge the potential of these materials in the light of total life expectancy through both the processing and regeneration conditions rather than from their simple creep behavior alone. R.J.F.

N84-33475# Pratt and Whitney Aircraft Group, West Palm Beach, Fla. Government Products Div.

MANUFACTURING DEVELOPMENTS TO REDUCE STRATEGIC MATERIALS USAGE c31

M. M. Allen, D. S. Halfpap, and M. A. Siegel *In* AGARD Mater. Substitution and Recycling Apr. 1984 8 p (For primary document see N84-33465 23-23)

Copyright. Avail: NTIS HC A13/MF A01

Manufacturing development programs to reduce the usage in gas turbine engines are examined. Several programs which provided significant of cobalt, titanium, and tantalum results in reducing raw materials requirements, that have been reduced to practice are described. The programs include forging and casting complex parts to near net shape, recycling of machining scrap and used parts, repair and refurbishment of damaged or worn parts, and component retirement for cause. In addition to reduction of strategic material usage, the programs resulted in lower cost parts due to reduced material input requirements and less machining. E.A.K.

N84-33476# GEC Turbine Generators Ltd., Whetstone (England). Central Metallurgical Labs.

PRACTICAL IMPLICATIONS OF THE USE OF ALUMINIDE COATINGS FOR THE CORROSION PROTECTION OF SUPERALLOYS IN GAS TURBINES c07

A. Strang, E. Lang (Commission of the European Communities), and R. Pichoir (ONERA) *In* AGARD Mater. Substitution and Recycling Apr. 1984 35 p refs (For primary document see N84-33465 23-23)
Avail: NTIS HC A13/MF A01

The difficulties incurred in the pack aluminizing of superalloys, especially in prolonging component life without emphasis on performance, integrity and safety of the engine are considered. The objectives and requirements of using aluminide coatings, the processes currently commercially available, the compatability of aluminide coatings with various superalloys substrates and quality control of both the coating and the coated component are reviewed. The properties of coatings themselves are considered for corrosion resistance, overall thermal and structural stability, and effect on the mechanical properties of the substrate. Long term corrosion protection is examined for the practicalities of reclaiming and recoating of exservice turbine parts to extend component life and conservation of critical materials. E.A.K.

N84-33477# Atomic Energy Research Establishment, Harwell (England). Materials Development Div.
COATINGS FOR FUEL ECONOMY OR MATERIALS SUBSTITUTION **c26**
J. P. Coad and K. T. Scott *In* AGARD Mater. Substitution and Recycling Apr. 1984 11 p refs (For primary document see N84-33465 23-23)
Copyright. Avail: NTIS HC A13/MF A01

The application of three coatin techniques in fuel economy or materials substitution is described. The coating techniques are plasma spraying, sputter ion plating (SIP) and plasma assited vapor deposition (PAVD), ad the applications range from thin coatings for nuclear and aerospace use to free standing furnace elements. E.A.K.

N84-33478# Naval Material Command, Washington, D. C.
THE NAVY PROGRAM TO DEVELOP REPLACEMENTS FOR CRITICAL AND STRATEGIC MATERIALS **c31**
James J. Kelly and Marlin A. Kinna (Naval Sea Systems Command) *In* AGARD Mater. Substitution and Recycling Apr. 1984 10 p (For primary document see N84-33465 23-23)
Avail: NTIS HC A13/MF A01

The development of design options for critical and strategic materials (CSM) in future weapon and platform systems is discussed. Key objectives of the program are: development of a data base, fabrication of materials and components, demonstration of hardware, and establishment of manufacturing processes to provide reproducible materials and components. Four materials thrusts are addressed, they are: utilization of domestically abundant materials, development of domestic high temperature materials, evaluation of new materials and alloys, and conservation of critical materials. E.A.K.

N84-33479# Army Materials and Mechanics Research Center, Watertown, Mass.
CERAMICS AS SUBSTITUTES FOR SCARCE METALS **c27**
R. Nathan Katz *In* AGARD Mater. Substitution and Recycling Apr. 1984 8 p refs (For primary document see N84-33465 23-23)
Avail: NTIS HC A13/MF A01

Opportunities for the use of ceramics as substitutes in several example applications, were explored. Lack of domestic availability of critical industrial metals, such as chromium and cobalt make the U.S. economy vulnerable to supply disruption. These critical metals are primarily used as high temperature, corrosion resistant or metal cutting alloys. Modern high performance ceramics are attractive substitutes for critical metals in many of these applications. E.A.K.

N84-33480# Bureau of Mines, Washington, D. C. Div. of Materials and Recycling.
NEW DEVELOPMENTS IN MATERIALS RECYCLING BY THE US BUREAU OF MINES **c31**
Robert C. Horton and Charles B. Kenahan *In* AGARD Mater. Substitution and Recycling Apr. 1984 24 p refs (For primary document see N84-33465 23-23)
Copyright. Avail: NTIS HC A13/MF A01

The mineral based waste products generated by industry and the consuming public as potential secondary mineral resources to be used for recycling materials are considered. Technical solutions are presented to complex recycling problems, such as: recovery of cobalt, nickel, and chromium from superalloy scrap; the separation, recovery, and reuse of nickel and chromium from stainless and specialty steel wastes; precious metal recovery from electronic scrap; an environmentally acceptable method for recycling lead acid batteries; recovery of nonferrous metals from scrap automobiles; and rapid scrap identification methods suitable for today's modern alloys. E.A.K.

N84-33481# Imphy S.A. (France). Etudes et Recherches.
VACUUM RECYCLING EFFECT ON MINOR ELEMENTS IN SUPERALLOYS [EFFET DES TRAITEMENTS SOUS VIDE SUR L'EVOLUTION ES TENEURS EN ELEMENTS TRACES DANS LES SUPERALLIAGES] **c31**
J. F. Wadier and J. Morlet *In* AGARD Mater. Substitution and Recycling Apr. 1984 12 p refs In FRENCH; ENGLISH summary (For primary document see N84-33465 23-23)
Copyright. Avail: NTIS HC A13/MF A01

Superalloy recycling is an economical and strategical necessity. Scrap recovery is examined from a thermodynamical and technological point of view with emphasis on air melting with oxygen blowing to remove titanium and aluminum before vacuum treatment; and non reactive melting of conditioned scraps in vacuum induction melting. The vacuum effect on the carbon/oxygen reaction, desulfurization and nitrogen removal, and heavy metal distillation is examined. Further reactions during remelting in VAR or ESR are taking account to assure the quality of the final product. Author

N84-33482# Societe Nationale d'Etude et de Construction de Moteurs d'Aviation, Paris (France).
PROBLEMS PRESENTED TO ENGINE BUILDERS BY THE RECYCLING OF METALLIC MATERIALS [PROBLEMES POSES AUX MOTORISTES PAR LE RECYCLAGE DES MATERIAUX METALLIQUES] **c26**
Y. Honnorat and J. Nouailles *In* AGARD Mater. Substitution and Recycling Apr. 1984 7 p refs In FRENCH (For primary document see N84-33465 23-23)
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Fabrication of the principal parts of aircraft engines implies assurance of a safe life that is not always completely verifiable by nondestructive quality control. Besides, the products of fabrication are often very weak and the cost of parts is greatly influenced by the economy of the material. The engine builder must then recycle scrap which is even more profitable since the recycling circuit is much shorter. Recycling is apt to generate problems of quality for which precautions should be taken. Examples from using forged titanium alloys and heat resistant nickel base alloys in the lost process illustrate the mechanisms by which recycling of scrap influences the quality of parts. The respective roles of different partners, the alloyist, the coarse part fabricator, the engine builder, and the recyclist are delineated. This means that acceptance control techniques offer the engine builder to master the problem are explained. Transl. by A.R.H.

N84-33483# Pratt and Whitney Aircraft Group, West Palm Beach, Fla. Government Products Div.
COATING DEVELOPMENTS TO RESTRICT STRATEGIC MATERIALS USAGE **c27**
R. J. Hecht and D. S. Halfpap *In* AGARD Mater. Substitution and Recycling Apr. 1984 7 p (For primary document see N84-33465 23-23)
Copyright. Avail: NTIS HC A13/MF A01

The development of protective coatings that enabled the implementation of less environmentally stable alloys with no loss, and sometimes an increase, in component capability and life is described. Development of tailored MCrAly overlay coatings, improved diffusion aluminides, thermal barriers, and alternate wear

resistant coatings allows the coating corrosion and oxidation life to be more independent of the base superalloy composition and hence allow more latitude in alloy selection. The resulting coating developments and their effects on reducing strategic element use are presented. E.A.K.

N84-33484# National Physical Lab., Teddington (England). Div. of Materials Applications
TRACE ELEMENTS IN SUPERALLOYS AND THE IMPLICATIONS FOR RECYCLING **c26**
P. N. Quested, T. B. Gibbons, and G. L. R. Durber (Glossop Superalloys Ltd.) *In* AGARD Mater. Substitution and Recycling Apr. 1984 17 p refs (For primary document see N84-33465 23-23)
Copyright. Avail: NTIS HC A13/MF A01

The general problem of control and specification of impurity elements with emphasis on the situation related to recycled alloys and the influence of certain impurities on microstructure and properties are considered. It is shown that there is scope for the improvement of specifications for impurity elements and that a better understanding of the relationship between casting conditions and microstructure is required for conventionally cast alloys.E.A.K.

N84-33485# Ecole des Mines, Paris (France). Centre des Materiaux.
THE EFFECT OF RECYCLING ON CAST STRUCTURES AND THE INTERNAL CHARACTER OF IN100 ALLOY: A LABORATORY STUDY [EFFET DU RECYCLAGE SUR LES STRUCTURES DE FONDERIE ET LA SANTE INTERNE DE L'ALLIAGE IN 100: ETUDE DE LABORATOIRE] **c26**
Sylvie Rupp, Jean Massol, Yves Bienvenuu, and Gerard Lesoult (Ecole des Mines, Nancy) *In* AGARD Mater. Substitution and Recycling Apr. 1984 14 p refs In FRENCH (For primary document see N84-33465 23-23)
Copyright. Avail: NTIS HC A13/MF A01

Some lots of virgin and recycled IN 100 alloys were selected by two European superalloy founderies (united European research). A laboratory study attempted to interpret in terms of solidification, the more marked tendency to microporosity observed by smelters in the recycled lots. Differential thermal analysis does not show the characteristic variations in the temperature of solidification except for those imputable to the slight variation in composition. Wetting during directional solidification permits measurement of the magnitude of morphology which governs the circulation of liquid in the viscous zone which comes to compensate for contraction during solidification. Differences in the precipitation kinetics in solid phases are observed between virgin and recycled alloys. Preliminary results of a study on Mar-M-002 alloy are also presented. Transl. by A.R.H.

N84-33486# Centre de Recherches Metallurgiques, Liege (Belgium). Div. Formetal.
USING RECYCLED SUPERALLOYS IN PRECISION CASTING [MISE EN OEUVRE DE SUPERALLIAGES DE REEMPLOI EN FONDERIE DE PRECISION] **c31**
M. Lambergts and J. M. Drapier *In* AGARD Mater. Substitution and Recycling Apr. 1984 12 p refs In FRENCH (For primary document see N84-33465 23-23)
Copyright. Avail: NTIS HC A13/MF A01

The recycling of cast scrap is not uniquely justified by fear of difficulties in supplying primary metals or by care to preserve the relationship limited natural supplies of certain of these materials: it is imperative that the smelter minimize costs. Recyling can, however, lead to a deterioration of the metallurgical properties of precision cast superalloys and to a certain chemical contamination that can affect the service life of cast parts. Recycling can be introduced only after careful control of all the consequences. The influence of recycling on composition (trace elements), solidification behavior, microstructure, and mechanical properties was investigated in various nickel alloys such as IN 100, IN 728, and Mar-M-002. Cobalt alloys such as X45 and W152 were also studied. Particular emphasis is given to inclusion content and to the tendency to microporosity. The technical occurrence and economics of an eventual hot isostatic compression cycle is evaluated. Transl. by A.R.H.

N84-33487# National Aeronautical Establishment, Ottawa (Ontario). Structures and Materials Lab.
TRACE ELEMENTS AND RESIDUAL ELEMENTS IN SUPERALLOYS **c26**
Richard T. Holt *In* AGARD Mater. Substitution and Recycling Apr. 1984 14 p refs (For primary document see N84-33465 23-23)
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Impurities and trace elements in nickel base superalloys were studied. Improvements in refinement technology are discussed, including evaluation of refactory materials to ensure minimal accumulation of inclusions. The section on detrimental elements covers: (1) residual gases and porosity; (2) nonmetallic inclusions; and (3) residual elements sulfur, phosphorus and other tramp elements which segregate to grain boundaries. This segregation leads to intergranular fracture and the elements were studied by auger electron spectroscopy (AES). Beneficial elements, which are added in small amounts to counteract the effect of the tramp elements are described. Some of those beneficial elements in small residual amounts may also help with grain size control. The processing of scrap with emphasis on minimizing the inclusion and trace element content of the alloys. E.A.K.

N84-33488# Paderborn Univ. (West Germany).
RECYCLING CONFORM DESIGN **c31**
Walter Jorden *In* AGARD Mater. Substitution and Recycling Apr. 1984 5 p refs (For primary document see N84-33465 23-23)
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The flow of materials in a real recycling system was demonstrated by a recycling model system. The analysis of this system results in additional new goals and guide lines for design. The guide lines are interpreted by examples which show how a product can be designed in a recycling conform manner. Each product should be prepared in an optimal way for the eventual reuse of the whole product and, after the end of product life, for regaining the residue materials. E.A.K.

N84-33489# Joint Publications Research Service, Arlington, Va.
USSR REPORT: MATERIALS SCIENCE AND METALLURGY 20 Aug. 1984 59 p refs Transl. into ENGLISH from various Russian articles
(JPRS-UMS-84-006) Avail: NTIS HC A04/MF A01

This USSR report covers information in the areas of materials science and metallurgy. The following topics are reported on: (1) aluminum and its alloys; (2) flaw detection in metals; (3) metal coatings; (4) composite materials; (5) ferrous metallurgy; (6) powder metallurgy; (7) superalloys; (8) titanium and its alloys; and (9) laser welding. For individual titles, see N84-33490 through N84-33518.

N84-33490# Joint Publications Research Service, Arlington, Va.
ACTIVATED ALUMINUM ALLOY FOR GENERATING HYDROGEN FUEL Abstract Only **c28**
V. Ryndin *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-0060) 20 Aug. 1984 p 1 Transl. into ENGLISH from Kazakhstansk. Pravda (USSR), 25 May 1984 p 4 (For primary document see N84-33489 23-23)
Avail: NTIS HC A04/MF A01

Scientists believe that a successful solution of the energy problem depends in large measure on the utilization of hydrogen as a fuel. A new exhibit on hydrogen energy has opened at the USSR Academy of Sciences' Physics pavillion at the USSR Exhibition of National Economic Achievements. Here various hydrogen units and motor vehicle and tractor engines running on the gaseous fuel are being demonstrated. Scientists of the Kazakh Academy of Sciences' Institute of Organic Catalysis and Electrochemistry have submitted to the exhibit a new aluminum-based alloy activated by additions of rare metals and tin. When this alloy reacts with water, hydrogen is formed. Only the aluminum dissolves, while the activators settle at the bottom of the reactor and can be used for the production of new alloy. The innovation

has passed laboratory tests and its commercial testing has now begun at the Ukrainian Academy of Sciences' Institute of Machine-Building Problems. Author

N84-33491# Joint Publications Research Service, Arlington, Va.
MHD TECHNOLOGY IN ALUMINUM CASTING Abstract Only **c26**
I. Kalinichenko *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-006) 20 Aug. 1984 p 2 Transl. into ENGLISH from Pravda (Moscow), 6 Jun. 1984 p 2 (For primary document see N84-33489 23-23)
Avail: NTIS HC A04/MF A01

The use of MHD technology in aluminum casting is discussed. Associates of the Latvian Academy of Sciences' Institute of Physics developed magnetohydrodynamic units for the Siberian plant. A MHD unit made it possible to free five persons from heavy work at the plant. Labor productivity doubled in this section. With the aid of the magnetic field, the alloy silumin is obtained in only three hours. Specialists of the Irkutsk affiliate of the All-Union Scientific Research and Design Institute of the Aluminum, Magnesium and Electrode Industry are convinced that MHD technology has a bright future. However, this will necessitate the development of new MHD technology for different types of casting facilities, with their specific features taken into account. B.W.

N84-33492# Joint Publications Research Service, Arlington, Va.
STUDY OF SIZE FACTOR EFFECT ON LOW-CYCLE FATIGUE OF ALUMINUM ALLOYS Abstract Only **c26**
A. L. Kaplinskiy *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-006) 20 Aug. 1984 p 3 Transl. into ENGLISH from Probl. Prochnosti (Kiev), no. 5, May 1984 p 18-20 (For primary document see N84-33489 23-23)
Avail: NTIS HC A04/MF A01

The range of thickness changes in thin materials used in cryogenic technology for pressurized containers and shipping vessels for liquified gases is of importance due to the need to determine useful life and dependability of such containers. The present article reports on study of AMg6 and AMnS alloys of 30 x 6 x 2.5 mm and 100 x 30 x 10 mm to determine size factors in structural strength of welded-seam containers. The author measured fatigue plasticity and relative contraction. Results indicated that the alloy AMg6 was more durable than AMnS. The durability of large welded specimens at both room temperature of 293 K and the temperature of liquid nitrogen (77 K) decreased by 12-15% in the quasistatic and fatigue failure ranges. These results should be taken into consideration when designing containers for cryogenic uses. Author

N84-33493# Joint Publications Research Service, Arlington, Va.
PORTABLE ELECTROMAGNETIC FLAW DETECTOR FOR METAL PRODUCTS Abstract Only **c26**
K. Chavaga *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-006) 20 Aug. 1984 p 4 Transl. into ENGLISH from Sov. Kirg. SSR (Frunze), 26 Jun. 1984 p 3 (For primary document see N84-33489 23-23)
Avail: NTIS HC A04/MF A01

A versatile electromagnetic flaw detector which has been developed by associates of the Ukrainian Academy of Sciences' Physical-Mechanical Institute readily detects metal fatigue and hidden flaws inside metal structures. The instrument operates on the basis of the nondestructive flaw-detection method. As its sensor approaches the surface of the structure that is to be inspected, eddy currents that are sent out penetrate the metal and instantly report the presence of dangerous cracks, various pores and corrosion damage which the eye cannot see. Images of these flaws appear on the screen of a cathode-ray tube and are accompanied by a sound signal. Tests made in industrial conditions have shown that the materials with different electric conductivities can be inspected, even beneath a multi-layered casing as thick as 5 millimeters. B.W.

N84-33494# Joint Publications Research Service, Arlington, Va.
C.A.T. SCANNER FOR DETECTING FLAWS IN METALS Abstract Only **c26**
Z. Kudrya *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-006) 20 Aug. 1984 p 5 Transl. into ENGLISH from Izv. (Moscow), 7 Jul. 1984 p 1 (For primary document see N84-33489 23-23)
Avail: NTIS HC A04/MF A01

A computer tomograph which has been developed by the Spektr research and production association in Moscow makes it possible to see the invisible. This instrument is intended for finding microscopic cracks in metal. It is capable of peering into very thin wire as well as into a powerful turbine. Detectors capture the rays, convert them into electric signals and transmit them to a computer. The computer, which performs 100 million operations a second, processes this information and reproduces the object on the screen in the form of a two-dimensional color image. The tomograph's sensitivity is as high as 0.006 percent, whereas the maximum sensitivity in conventional radiography is 1-2 percent. B.W.

N84-33495# Joint Publications Research Service, Arlington, Va.
CORROSION RESISTANT GLASS COATING FOR METALS Abstract Only **c27**
G. Namtalashvili *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-006) 20 Aug. 1984 p 6 Transl. into ENGLISH from Sots. Industr. (Moscow), 23 May 1984 p 2 (For primary document see N84-33489 23-23)
Avail: NTIS HC A04/MF A01

Scientists of the Georgian Polytechnical Institute have proposed coating metal with a special glass so that it can acquire corrosion-resistant properties. The scientists have developed a process for producing such glass from a mixture of various by-products of mining industry. The lining of the inner surfaces of tanks used in the chemical industry with the Tbilisi glass has begun at the Khimash (chemical machinery) plant in Poltava. The scientists have proposed manufacturing from the same by-products a glass for soldering metal, ceramics and other materials. Author

N84-33496# Joint Publications Research Service, Arlington, Va.
SCALE EFFECT OF FIBER STRENGTH AND PROPERTIES OF FIBER-BASED UNIDIRECTIONAL COMPOSITES Abstract Only **c24**
Yu. G. Korabelnikov, V. P. Tamuzh, O. F. Siluyanov, V. M. Bondarenko, and M. T. Azarova *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-006) 20 Aug. 1984 p 7 Transl. into ENGLISH from Mekhan. Kompozitnykh Materialov (Riga), no. 2, Mar. - Apr. 1984 p 195-200 (For primary document see N84-33489 23-23)
Avail: NTIS HC A04/MF A01

Reinforcing fibers are subject to a scale effect related to binding length. Previous studies have ignored the importance of fiber-matrix shift; the present study considers the effect of adhesion on composite material failure under stretching and offers a simplified theoretical model for determining applicable parameters. The hypothesis that strength increases with fiber separation in the composite is tested. The authors note that practice has shown that maximum theoretical strength is never reached because at low stress values, fiber breaks result in the development of major cracks. Various approaches to assessing the strength of fiber-reinforced composite materials are suggested, with emphasis on the Weibull distribution. The authors conclude that reducing fiber diameter and increasing adhesion are key factors for improving strength. A theoretical mathematical model is shown to coincide with experimental results. Author

N84-33497# Joint Publications Research Service, Arlington, Va.
DEFORMATION OF FIBER-REINFORCED LAMINATED COMPOSITE NEAR FREE SURFACE Abstract Only **c24**
A. A. Rassokha *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-006) 20 Aug. 1984 p 7-8 Transl. into ENGLISH from Mekhan. Kompozitnykh Materialov (Riga), no. 2, Mar. - Apr. 1984 p 228-232 (For primary document see N84-33489 23-23)
Avail: NTIS HC A04/MF A01

Studies of fiber-reinforced composites to determine stress and deformation have usually focused on heterogeneous properties, while failing to consider the effect of lateral compression on the free surface and elsewhere. The present article reports on more comprehensive consideration of both heterogeneity and free-surface deformation properties. An orthogonal reinforced regular parallelepiped with facets parallel to the reinforcing fibers was chosen as the test model. Effective elasticity moduli of inner and outer layers were found to be 4% less than those of inner laterally reinforced layers of the laminate. The theoretical results were verified by speckle-holographic interferometry, which showed that the stress in inter-fiber spaces (1.7 + or - 0.2) corresponded satisfactorily to theoretical values. Fiber separation had a predictably major effect on stress concentration. Author

N84-33498# Joint Publications Research Service, Arlington, Va.
DEFORMABILITY AND BEARING STRENGTH OF SHELLS MADE ON RELEASE MANDREL Abstract Only **c38**
V. S. Pichugin, V. D. Protasov, and Ye. I. Stepanychev *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-006) 20 Aug. 1984 p 8 Transl. into ENGLISH from Mekhan. Kompozitnykh Materialov (Riga), no. 2, Mar. - Apr. 1984 p 279-282 (For primary document see N84-33489 23-23)
Avail: NTIS HC A04/MF A01

While winding continues to be the basic method for making shells of composite materials, it has fundamental shortcomings related to structural density and contact pressure. The present article reports on production of such shells on a release mandrel and test results of deformability and bearing strength of such shells. A key feature of this method is related to the dependence of physicomechanical properties of wound plastics on stretching of reinforcing elements. While theoretical studies showed that a wet wrapping procedure could provide significant improvements in these parameters, existing release mandrel devices were unsuitable, so a new type, which is diagrammed and described, was designed. The key technical parameter is summary axial force, which was controlled during thermal processing to affect residual stress in the final product. Results showed that increasing the axial force improved bearing strength by 10-12% and failure stress resistance by 16-20% in spiral and ring layers. Other parameters, including axial deformability and shell mass reduction, were also improved. Some increase in rigidity was also noted.
Author

N84-33499# Joint Publications Research Service, Arlington, Va.
DEVELOPMENT OF FERROUS METALLURGY DESCRIBED Abstract Only **c26**
I. P. Kazanets *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-006) 20 Aug. 1984 p 10-14 Transl. into ENGLISH from Ekon. Gazeta (Moscow), no. 24, Jun. 1984 p 2 (For primary document see N84-33489 23-23)
Avail: NTIS HC A04/MF A01

It is well known that the largest consumers of USSR products are tractor and agricultural machine building industries. Programs have been adopted to develop, assimilate, and incorporate economical types of metal for agricultural equipment. These programs call for utilization of new materials and improvements in the quality of metal products to bring about an increase in the life engines from 400 to 8000-10,000 hours. Improving the durability of the frames should reduce the weight and increase the service life of agricultural machinery and tractors from 6,000 to 10, 000 hours. To help carry out the Energy Program, ferrous metallurgy is organizing the production of new, highly durable well-drilling casings and pump-compressor pipes with progressive designs, made primarily of cold-resistant and rust-resistant materials; as well as a large-diameter pipe with external and internal insulation for gas transport; and pipes for the transport of oil and petroleum products. B.W.

N84-33500# Joint Publications Research Service, Arlington, Va.
MECHANICAL PROPERTIES OF COMPONENTS MADE FROM POWDERS RECEIVED BY PROCESSING LOW-GRADE POROUS TITANIUM Abstract Only **c26**
V. A. Pavlov, S. N. Kororkin, Zh. G. Volchok, V. A. Krozdenko, G. V. Avrunina, and V. M. Prozorov *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-006) 20 Aug. 1984 p 18 Transl. into ENGLISH from Tsvetn. Metal. (Moscow), no. 5, May 1984 p 92-93 (For primary document see N84-33489 23-23)
Avail: NTIS HC A04/MF A01

Titanium powders produced from screening better quality ore were studied to determine mechanical qualities of components made up of powders with dimensions of -1.0+0.63, -1.0+0.18 and -.63+0.10 mm. The powders were sintered at 1000 and 1200 C in vacuum ovens, then hot stamped after heating at 950-975 C in an argon medium. Resuits indicated that the products were equal in durability to stamped titanium products, but due to impurities, their plastic properties were much lower. Vacuum sintering relieved internal stresses and redistributed impurities, thus reducing instability, but no appreciable improvement in plastic properties resulted. Components requiring durability without tensile strength can be made of this type of powdered titanium. Author

N84-33501# Joint Publications Research Service, Arlington, Va.
PRODUCTION OF EXTRA-PURE IRON FOR CERMET BEARINGS Abstract Only **c26**
A. Kovtun *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-006) 20 Aug. 1984 p 18 Transl. into ENGLISH from Rabochaya Gazeta (Kiev), 3 Jul. 1984 p 1 (For primary document see N84-33489 23-23)
Avail: NTIS HC A04/MF A01

The article reports on a new process for producing iron powder that is almost chemically pure. The process was demonstrated for the author of the article by workers of the Brovary Powder Metallurgy Plant, where the process has been introduced. The iron powder obtained from the process is used in the production of cermet bearings. These bearings have pores which are filled with an oil lubricant. Parts employing the bearings can operate for years without additional lubrication, it is claimed. Author

N84-33502# Joint Publications Research Service, Arlington, Va.
POWDER METALLURGY R AND D ORGANIZATIONS FEATURED Abstract Only **c26**
V. Dolmatov *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-006) 20 Aug. 1984 p 19 Transl. into ENGLISH from Sov. Rossiya (Moscow), 7 Jul. 1984 p 2 (For primary document see N84-33489 23-23)
Avail: NTIS HC A04/MF A01

The author visited a number of research organizations and industrial facilities that are developing and introducing power metallurgy technology observations and findings are reported.
B.W.

N84-33503# Joint Publications Research Service, Arlington, Va.
EFFECT OF STRESS CONCENTRATION ON FATIGUE RESISTANCE OF HEAT-RESISTANT NICKEL ALLOYS Abstract Only **c26**
M. S. Belyayev and N. D. Zhukov *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-006) 20 Aug. 1984 p 21 Transl. into ENGLISH from Probl. Prochnosti (Kiev), no. 5, May 1984 p 10-14 (For primary document see N84-33489 23-23)
Avail: NTIS HC A04/MF A01

Sensitivity to stress concentrations is an important feature of durability. The present article reports on study of three types of stress concentrations for varying loads on heat resistant nickel alloys, taking into account structure, production technology, temperature and base of testing and the magnitude of the theoretical coefficient of stress concentration. Tests were made using straight circular bending and compression stretch at 50 Hz at room and elevated temperatures. Stamped and two types of cast nickel alloy components were tested. Results showed that at room temperature, the basic mechanism for tempering nickel alloys was essentially ineffective. Crystallized alloys had the same phase components and defects as other forms, but were more sensitive to stress concentrations due to microplastic deformation features at room temperature. At higher temperatures the theoretical coefficient of stress concentration increased in a monotonic

manner. The fatigue curve under the test conditions showed a sudden shift in straight circular bending at about 10 to the 8th power cycles; a more regular curve was found with compression stretch tests. Author

N84-33504# Joint Publications Research Service, Arlington, Va.
KINETIC TIME-TEMPERATURE EQUATION FOR CREEP OF HEAT-RESISTANT ALLOYS TAKING AGING INTO ACCOUNT Abstract Only **c26**
V. N. Kiselevskiy *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-006) 20 Aug. 1984 p 21-22 Transl. into ENGLISH from Probl. Prochnosti (Kiev), no. 5, May 1984 p 7-10 (For primary document see N84-33489 23-23)
Avail: NTIS HC A04/MF A01

Kinetic principles of creep in heat resistant steels and alloys help to give relatively precise estimates of deformation all the way to failure, but the accuracy of calculated values for the first phase of creep is poor, notably in alloys with high nickel and molybdenum content. This divergence is attributed to heat effects on redistribution of deformation from granular boundaries to the matrix. Theoretical calculations of this process for OKh16N15M3B steel and alloys of the Kh20N45M4 type are presented. The shortcomings of the approach used are chiefly of a practical nature, so that further calculation and experimental verification were performed to show that creep deformation depends on activation energy of destructive processes, as well as on activation energy variations and plastic flow. Since, however, the formulas developed are based on energy variations and not absolute values, their application is limited. Author

N84-33505# Joint Publications Research Service, Arlington, Va.
ELASTIC PROPERTIES OF TEXTURED SHEETS OF TWO-PHASE TITANIUM ALLOYS Abstract Only **c26**
I. G. Zakharchenko, V. S. Ivaniy, N. V. Ivaniy, and V. S. Kshnyakin *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-006) 20 Aug. 1984 p 24 Transl. into ENGLISH from Fiz. Metal. Metalloved. (Sverdlovsk), v. 57, no. 4, Apr. 1984 p 818-821 (For primary document see N84-33489 23-23)
Avail: NTIS HC A04/MF A01

Voigt, Reuss, and Hill averaging are used to calculate the elastic properties of sheets of two phase titanium alloys considering the texture state of each phase in the alloy. Texture classification is based on the theory of symmetry, according to which each texture can be considered quasisingle crystals described by the corresponding symmetry group. Rolling textures of both alpha and beta phase polycrystalline alloys were considered quasisingle crystals of orthorhombic symmetry. The elastic properties of the texture of each phase are unambiguously determined by a fourth rank tensor containing 9 constants. Texture elasticity moduli were calculated for sheets of industrial two phase alpha+beta titanium alloys VT14 and VT23 as delivered. Analysis of the data indicate that VT14 in which the beta phase content is not over 1% to 12% has an angular variation of Young's modulus similar to that observed in single phase alpha alloys with the same rolling texture type. Increasing the beta phase content to 30 to 35% causes this variation to change significantly approaching the angular variation of Young's modulus observed in beta titanium. Author

N84-33506# Joint Publications Research Service, Arlington, Va.
TEXTURE EFFECT ON ANISOTROPY OF ELECTRIC AND MAGNETIC PROPERTIES OF TITANIUM ALPHA-ALLOYS Abstract Only **c26**
N. D. Reymer, R. A. Adamescu, and V. V. Mukhayev *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-006) 20 Aug. 1984 p 24-25 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Metal. (Moscow), no. 3, May - Jun. 1984 p 122-125 (For primary document see N84-33489 23-23)
Avail: NTIS HC A04/MF A01

Magnetic and electric properties of polycrystalline alpha alloys of titanium with hexagonal, dense structures tend toward anisotropy. The magnetic susceptibility and mean electrical resistance of VT5-1 and OT4-1 alloys were studied after cold rolling at compression ranging from 20% to 70% for the former, and 30% to 80% for the latter alloy. Subsequent X-ray studies of the crystalline structure confirmed its role in determining the nature of anisotropy of susceptibility in relation to the degree of compression. Differences in these parameters for the two alloys show that manganese has more influence on magnetic susceptibility than tin in titanium alloys. Author

N84-33507# Joint Publications Research Service, Arlington, Va.
ELECTRON MICROSCOPE STUDY OF PROCESSES OF POLYGONIZATION AND RECRYSTALLIZATION IN ALPHA-PHASE OF TWO-PHASE (ALPHA + BETA)-TITANIUM ALLOYS WITH PLATE STRUCTURE Abstract Only **c26**
N. Z. Pertsovskiy, N. M. Semenova, M. Ya. Brun, and O. A. Mozolevskaya *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-006) 20 Aug. 1984 p 25 Transl. into ENGLISH from Fiz. Metal. i Metalloved. (Sverdlovsk), vol. 57, no. 4, Apr. 1984 p 737-743 (For primary document see N84-33489 23-23)
Avail: NTIS HC A04/MF A01

Experiments were performed on a typical two phase (alpha + beta) titanium alloy, type VT3-1. Results show that heterogeneity of the structure of semifinished goods after hot deformation and subsequent annealing results basically from differences in the flow of recrystallization in the alpha phase, which in turn results from heterogeneity of the effect of deformation on the alpha plates which have different orientation within the limits of a single initial beta grain. The structural heterogeneity influences the level of the mechanical properties. In (alpha + beta) titanium alloys with beta transformed structure there are two recrystallization mechanisms: formation and growth of new alpha grains within the initial alpha plates; and separation of alpha plates into globules as disorientation between subgrains exceeds 10 deg to 15 deg. Unidirectional deformation of two phase alloys with heating to the (alpha + beta) area does not assure homogeneous occurrence of recrystallization in the alpha phase. Author

N84-33508# Joint Publications Research Service, Arlington, Va.
PLASTICITY OF LARGE-GRAIN TITANIUM ALLOY TYPE VT30 IN THE BETA AREA Abstract Only **c26**
O. A. Kaybyshev, R. M. Galeyev, and G. A. Salischev *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-006) 20 Aug. 1984 p 26 Transl. into ENGLISH from Fiz. Metal. i Metalloved. (Sverdlovsk), vol. 57, no. 4, Apr. 1984 p 788-794 (For primary document see N84-33489 23-23)
Avail: NTIS HC A04/MF A01

The structure and mechanical properties of VT30 alloy during hot deformation were studied. The alloy was studied in two states: initial hot rolled and annealed at 1000 C. The mechanical properties were determined in extension at 0.000033 to .0033 /s. Deformation relief was examined on a polished surface of the specimens. Microstructure of the deformed specimens was studied by optical metallography and electron microscopy. It was found that VT30 with large grain microstructure shows signs of superplasticity upon deformation in the beta area. Conditions of superplasticity correspond to formation and constant reproduction of subgrain structure in the process of deformation. Grain boundary slipping occurs along the boundaries of the initial grains and the subgrains formed during deformation, which makes a definite contribution to total deformation. Author

N84-33509# Joint Publications Research Service, Arlington, Va.
LOW-CYCLE FATIGUE OF VT1-0 ALLOY AND CHANGES IN ITS FINE STRUCTURE AT TEMPERATURES OF 293-4.2 DEG K Abstract Only **c26**
V. A. Strizhalo, Yu. N. Petrov, G. N. Nadezhdin, A. I. Zincheriko, V. L. Svechnikov, and N. D. Bakalinskaya *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-006) 20 Aug. 1984 p 26 Transl. into ENGLISH from Probl. Prochnosti (Kiev), no. 5, May 1984 p 14-18 (For primary document see N84-33489 23-23)
Avail: NTIS HC A04/MF A01

The physical nature of stress deformation instability at temperatures near that of liquid helium was studied by examining low cycle fatigue of the alpha titanium alloy VT1-0 during cooling to 4.2 K and structural aspects of its deformation and failure. The

test specimens, 2 mm in thickness, were subjected to a pulsating load at 2 cycle/min, at 293 K in air and 77 and 4.2 K in liquid nitrogen and helium. The intermittent viscosity observed in atmospheric and liquid nitrogen media was explained by adiabatic deformation under conditions of reduced heat absorption and transmission. Cyclic creep in the liquid helium, collapse of cellular structure and formation of doublets in alpha titanium at 4.2 K confirmed the function of these factors in the intermittent viscosity of VT1-0 alloy at the temperature of liquid helium. Dynamic deformation hardening and increased twinning are the key determinants of fatigue. Author

N84-33510# Joint Publications Research Service, Arlington, Va.
DEFORMATION AND FAILURE OF TITANIUM ALUMINIDE Abstract Only **c26**
S. M. Barinov and Z. A. Samoylenko *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-0060 20 Aug. 1984 p 27 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Metal. (Moscow), no. 3, May - Jun. 1984 p 164-168 (For primary document see N84-33489 23-23)
Avail: NTIS HC A04/MF A01

The intermetallic compound TiAl has great heat resistance and hardness, but brittleness below 700 C limits its applications. This brittleness was analyzed by studying temperature correlation with mechanical properties and interatomic interactions in a stoichiometric alloy with 36% aluminum. Mechanical properties were measured in a temperature of 20 C to 1300 C by concentrated bending of smooth and cracked samples. Microhardness, X-ray, and fractographic studies were also made. An ion covalent component discovered in the test TiAl alloy was attributed to the boron alloying agent. The latter increased the covalent component, probably at the expense of the boride phase, and also increased the metallic component. Methodological shortcomings prevented precise measurement of TiB2. The refining effect of boron was similar to its effect in molybdenum, while segregation defects in the process before emission of boride and metallization of the covalent component are probably related to the properties found in the titanium aluminide alloy. Granular pulverization also contributes to its low temperature brittleness. Author

N84-33511# Joint Publications Research Service, Arlington, Va.
EFFECT OF THERMOCYCLIC PROCESSING ON PHASE COMPOSITION AND STRUCTURE OF VT22 ALLOY Abstract Only **c26**
V. N. Gridnev, O. M. Ivasishin, and V. L. Svechnikov *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-006) 20 Aug. 1984 p 27-28 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Metal. (Moscow), no. 3, May - Jun. 1984 p 136-141 (For primary document see N84-33489 23-23)
Avail: NTIS HC A04/MF A01

Highly alloyed VT22 was thermocycled at temperatures from room temperature to 750 C, with 15 minute retention at the highest temperature of any series followed by air cooling. The heating rate was 2.5 C/sec. The alloy's original alternating alpha and beta phase, the latter in particular with relatively low defectiveness, changed after one cycle as the transformation alpha-beta-beta at temperatures of 750 C took place and was fixed during cooling. A second type of structure underwent dissolution of disperse alpha phase particles, while platelets of the primary alpha phase decreased slightly in size. The principal change from initial structure to that after one cycle was the absence of the face centered cubic lattice phase in the processed alloy. This change was taken as indirect evidence that formation of the face centered cubic lattice phase is not always an intermediate stage in alpha beta conversions. Another important feature is the increase in numbers of microdoublets of the alpha phase. Interphase stress relaxation in the beta phase was almost totally absent, indicating increased durability and suggesting that thermocyclic processing is ineffective for use with alloys that already contain high beta phase amounts. On the other hand, its use can be very effective in increasing durability of predominantly alpha phase VT22 alloy. Author

N84-33512# Joint Publications Research Service, Arlington, Va.
BONDING MATERIALS BY GAS-PHASE PRECIPITATION Abstract Only **c37**
V. K. Sokolov, Yu. M. Korolev, V. V. Frolov, V. I. Stolyarov, and V. F. Solovyev *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-006) 20 Aug. 1984 p 29 Transl. into ENGLISH from Tsvetn. Metal. (Moscow), no. 5, May 1984 p 88-91 (For primary document see N84-33489 23-23)
Avail: NTIS HC A04/MF A01

Tests were conducted at below melting temperatures for porous materials, foils, wires and other small gauge metals materials and did not involve recrystallization. Necessary conditions for success in such bonding were sufficient durability of the precipitate, presence of bond durability conditions for both precipitate and base material, and absence of reactions between the materials and the gas phase medium used. The processes involved are hydrogen reduction of volatile halides such as fluorides and chlorides, thermal decomposition of volatile iodides, bromides and chlorides, and thermal dissociation of volatile carbonyls and organic metal compounds. Particular success was achieved with tungsten hexafluoride precipitates. Angle, butt and lap joints were all produced successfully, but with thicker specimens some edge preparation was necessary. With notching the stretch durability of joints ranged from 160 MPa to 250 MPa, and impact strength at the seam was 200 MPa to 300 MPa. The gas phase precipitation bonding process is recommended for thin walled large gauge components and for tungsten bonds with various metallic and ceramic materials. Author

N84-33513# Joint Publications Research Service, Arlington, Va.
CERTAIN FEATURES OF LASER WELDING WITH PENETRATING MELTING Abstract Only **c37**
A. I. Skripchenko, A. V. Surkov, and V. V. Bashenko *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-006) 20 Aug. 1984 p 29-30 Transl. into ENGLISH from Svarochnoy Proizv. (Moscow), no. 5, May 1984 p 14-16 (For primary document see N84-33489 23-23)
Avail: NTIS HC A04/MF A01

Welding processes and forms of penetrating melting in relation to radiation intensity penetrating the components being welded. The equipment used is diagrammed and described. Rate of welding was varied in the range of 4 mm/sec to 20 mm/sec, with constant power in the focal point. Results show that while the width of the bead on the surface closest to the laser varied little as component thickness and laser intensity increased, the bead on the opposite side shows significant variations. Thickness was also related to the formation of the weld puddle and heat conductivity. The basic mechanism of surface bead formation was found to be the heating of metal by the plasma source. The diameter of this upper channel was greater that that of the laser beam with penetrating melting. The radiation intensity passing through the metal was equal to the square of the thickness of the component being welded. Author

N84-33514# Joint Publications Research Service, Arlington, Va.
NARROW-SEAM LASER WELDING OF COMPONENTS OF LOW THICKNESS Abstract Only **c37**
G. I. Levin *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-006) 20 Aug. 1984 p 30 Transl. into ENGLISH from Svarochnoy Proizv. (Moscow), no. 5, May 1984 p 13-14 (For primary document see N84-33489 23-23)
Avail: NTIS HC A04/MF A01

As the depth of laser welding increases relative to seam width, defects become an increasingly serious problem. Two approaches to phase interactions in such seams are examined; the search for stable conditions with both liquid and gaseous phases present in the crater, and attempts to eliminate one of the interacting components, the liquid phase, up to a given critical level. Factors of the options indicate the latter to be simpler in analytic terms, although it requires prevention of crater collapse and metal loss in liquid drop form. The chief geometric factor was determined to be the beam diameter in the focal plane, which reaches 0.1 to 0.01 mm for CO2 lasers. The high frequency impulse radiation of

the procedure used was regarded to be a quasi-constant beam procedure. The process was determined to be sensitive to power intensity and wave length variations. The impulse CO2 laser used was judged to be the only laser suitable for this type of narrow seam welding. Author

N84-33515# Joint Publications Research Service, Arlington, Va.
FUSING CAPACITY OF CONCENTRATED LASER BEAM Abstract Only **c36**
A. I. Spripchenko and A. V. Surkov *In its* USSR Rept: Mater. Sci. and Met. (JPRS-UMS-84-006) 20 Aug. 1984 p 31 Transl. into ENGLISH from Svarochnoye Proizv. (Moscow), no. 5, May 1984 p 11-13 (For primary document see N84-33489 23-23)
Avail: NTIS HC A04/MF A01

The process of laser welding was mathematically modeled and axial irregularities of power intensity was studied. The model discounts absorption and refraction of the laser beam in the plasma torch and assumes that the radiation falling on the surface is completely absorbed by it and the depth of the gas vapor channel is significantly greater than its diameter. The calculated and experimental data agree, and show that the optimum focal length for the least energy losses in laser welding is (0.5 to 0.7)h, the latter being the optimum depth of focus for melting. Fusing capacity was found to increase with improved laser beam brilliance and to decrease as required depth increased. Author

N84-33516# Joint Publications Research Service, Arlington, Va.
INCREASING FUSION EFFICIENCY IN LASER WELDING WITH DYNAMIC BEAM FOCUSING Abstract Only **c37**
V. V. Ivanov, V. V. Baykov, A. G. Grigoryants, and I. N. Shiganov *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-006) 20 Aug. 1984 p 31 Transl. into ENGLISH from Svarochnoye Proizv. (Moscow), no. 5, May 1984 p 9-11 (For primary document see N84-33489 23-23)
Avail: NTIS HC A04/MF A01

A major shortcoming of laser welding in contrast to electron beam techniques is its relatively low heat efficiency. Attempts to increase that efficiency by dynamic beam focusing with an opticomechanical scanner. Comparison of data for fixed and dynamic focusing indicates that the depth of fusion melting can be increased by as much as 45%, with little dependence on the rate of welding. Study of longitudinal macrofilings showed that variations in melting depth were also minimized. Efficiency was increased by 69 to 87%, depending on the alloy tested: The PT-3V titanium alloy, with relatively low heat conductivity, showed lesser increases in welding efficiency than did the AMgo aluminum alloy with its significantly higher heat conductivity. Author

N84-33517# Joint Publications Research Service, Arlington, Va.
CERTAIN METALLURGICAL PROPERTIES OF LASER WELDING Abstract Only **c37**
A. V. Surkov and N. M. Novozhilov *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-006) 20 Aug. 1984 p 32 Transl. into ENGLISH from Svarochnoye Proizv. (Moscow), no. 5, May 1984 p 8-9 (For primary document see N84-33489 23-23)
Avail: NTIS HC A04/MF A01

The transfer of hydrogen, silicon, manganese and titanium from the original metal and nitrogen and oxygen from the gaseous phase into the metal of perlite and austenite seams produced by laser welding were studied and results compared with other welding techniques. Experiments were conducted on 10GN2MFA, 22K and 08Kh18N10T steels with a constant beam CO2 laser at a welding rate of 25 m/hr and beam angle of 73 deg. The content of alloying materials in the metal was determined by X-ray fluorescent analysis, and the gas content by vacuum fusion. Results show that losses of alloying elements are greater in laser welding than in arc and electron beam techniques. Nitrogen transfer to seam metal in laser welding is also less by 2 to 3 times than in arc welding with protective gases, so that nitrogen can be used as a protective gas in CO2 laser welding processes. Author

N84-33518# Joint Publications Research Service, Arlington, Va.
EFFECT OF SURFACE CONDITION AND EDGE PREPARATION ON METAL FUSION DURING LASER WELDING Abstract Only **c26**
V. A. Bashenko, N. V. Kulikov, and A. V. Surkov *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-006) 20 Aug. 1984 p 32 Transl. into ENGLISH from Svarochnoye Proizv. (Moscow), no. 5, May 1984 p 16-18 (For primary document see N84-33489 23-23)
Avail: NTIS HC A04/MF A01

The effectiveness of laser radiation on metal during welding depends on surface condition, protective gas used, angle of laser contact and other factors. The effects of various coatings and edge preparation procedures on melting effectiveness and seam formation are considered. Absorption of protective gas was measured on the basis of the plasma flow above the metal surface and the use of helium to prevent formation of a screening with KNO3, NH4F.HF, CaF2, CaCO3, Na2O+SiO2 or FeCl3 and FS-71 flux in thin coats that minimized pore formation. X-ray analysis shows that the best seam quality was achieved with KNO3 and CaF2 coatings and the FS-71 flux. Optic interruption in protective gas was found to absorb 45 to 60% of the laser beam's energy, but various additives increased the effectiveness of the laser, and seam preparation enhanced seam formation and the depth of fusion. Angle of contact was another important factor for effectiveness of laser welding. Author

24 COMPOSITE MATERIALS

Includes laminates.

N84-33519 Virginia Polytechnic Inst. and State Univ., Blacksburg.
A CHARACTERIZATION OF THE FRACTURE BEHAVIOR OF THICK, NOTCHED, LAMINATED GRAPHITE-EPOXY COMPOSITES Ph.D. Thesis
Charles Edmund Harris 1983 208 p
Avail: Univ. Microfilms Order No. DA8406625

The effect of laminate thickness on the fracture behavior of laminated graphite/epoxy (T300/5208) composites was studied on specimens with various thickness and plies. The center-cracked tension, compact tension and three point bend specimen configurations were studied. Fracture toughness was computed using the stress intensity factor results of a finite element stress analysis of each specimen geometry which treated the composite as homogeneous but anisotropic. The development of subcritical damage at the crack tip was studied nondestructively using enhanced X-ray radiography and destructively using the laminate deply technique. Results show fracture toughness is a function of laminate thickness. Dissert. Abstr.

N84-33520 Texas Univ., Austin.
A STUDY OF THE TRIBOLOGICAL PROPERTIES OF GRAPHITE FIBER-GLASS MATRIX COMPOSITES Ph.D. Thesis
Vijayeshwar Das Khanna 1983 185 p
Avail: Univ. Microfilms Order No. DA8414397

Graphite fiber-glass matrix composites, with the high hardness of the matrix and lubricating abilities of graphite, are expected to have excellent tribological properties. The friction and wear of these composites, sliding on hardened steel, was studied by using an enclosed environment Pin on Disc machine. The friction coefficient and wear rates, for a range of load, velocity and environment conditions, were determined by the continuous monitoring of the friction force and pin wear with a strain gage and a displacement transducer. The worn surfaces and wear debris were studied using scanning electron microscopy, energy dispersive spectroscopy and Auger electron spectroscopy. The composites were found to have low coefficients of friction (.15 to .2) and very low wear rates (.002 mm3/km), that were dependent on humidity. Very thin surface films were observed to form, with wear occurring by the abrasion/disruption of these films. The debris consisted of a submicron mixture of iron oxides, glass and graphite. The results indicate that the precursor composition and elastic modulus of the fibers do not strongly influence friction and wear. An explana-

tion is presented that shows the hard matrix is expected to support most of the load with the fibers only providing lubrication.
Dissert. Abstr.

N84-33521*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
DEVELOPMENT OF IN SITU STIFFNESS PROPERTIES FOR SHUTTLE BOOSTER FILAMENT WOUND CASE
V. Verderaime Aug. 1984 57 p refs
(NASA-TP-2377; NAS 1.60:2377) Avail: NTIS HC A04/MF A01 CSCL 11D

Subscale tests were extensively used to develop a data base on elastic properties of graphite-epoxy wound pressure vessels. Scaling phenomena were observed to influence biaxial strains. Causes for scaling are proposed and lamina models with scaling factors are presented. Author

N84-33522*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FRACTURE SURFACE CHARACTERISTICS OF NOTCHED ANGLEPLIED GRAPHITE/EPOXY COMPOSITES
Carol A. Ginty and Thomas B. Irvine 1984 25 p refs Presented at the Intern. Symp. on Composites: Mater. and Eng., Newark, Del., 24-28 Sep. 1984; sponsored by the Center for Composite Materials
(NASA-TM-83786; E-2284; NAS 1.15:83786) Avail: NTIS HC A02/MF A01 CSCL 11D

Composite fracture surface characteristics and related fracture modes have been investigated through extensive microscopic inspections of the fracture surfaces of notched angleplied graphite/epoxy laminates. The investigation involved 4 ply laminates of the configuration [+ or - theta](s) where theta = 0 deg, 3 deg, 5 deg, 10 deg, 15 deg, 30 deg, 45 deg, 60 deg, 75 deg, and 90 deg. Two-inch wide tensile specimens with 0.25 in. by 0.05 in. through-slits centered across the width were tested to fracture. The fractured surfaces were then removed and examined using a scanning electron microscope. Evaluation of the photomicrographs combined with analytical results obtained using the CODSTRAN computer code culminated in a unified set of fracture criteria for determining the mode of fracture in notched angleplied graphite/epoxy laminates. Author

N84-33523*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
COMPRESSION FAILURE MECHANISMS IN UNIDIRECTIONAL COMPOSITES
H. Thomas Hahn (Washington Univ.) and Jerry G. Williams Aug. 1984 44 p refs Presented at the 7th ASTM Symp. on Composite Mater., Philadelphia, 2-4 Apr. 1984
(NASA-TM-85834; NAS 1.15:85834) Avail: NTIS HC A03/MF A01 CSCL 11D

Compression failure mechanisms in unidirectional composites were examined. Possible failure modes of constituent materials are summarized and analytical models for fiber microbuckling are reviewed from a unified viewpoint. Due to deficiencies in available models, a failure model based on nonlinear properties and initial fiber curvature is proposed. The effect of constituent properties on composite compression behavior was experimentally investigated using two different graphite fibers and four different epoxy resins. The predominant microscopic scale failure mode was found to be shear crippling. In a soft resin, shear crippling was in the form of buckling of fibers on a microscopic scale. However, stiff resins failure was characterized by the formation of a kink band. For unidirectional laminates, compressive strength, and compressive modulus to a less extent, were found to increase with increasing magnitude of resin modulus. The change in compressive strength with resin modulus was predicted using the proposed nonlinear model. Author

N84-33524*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ANALYSIS OF INSTABILITY-RELATED GROWTH OF A THROUGH-WIDTH DELAMINATION
John D. Whitcomb Sep. 1984 57 p refs
(NASA-TM-86301; NAS 1.15:86301) Avail: NTIS HC A04/MF A01 CSCL 11D

The effect of various parameters on instability related delamination growth was studied. The configuration studied consisted of a thick composite laminate with a single through width delamination located near one surface. Both mechanical and thermal loads were considered. It is assumed that GI and GII govern delamination growth. An approximate superposition stress analysis was developed which gives closed form expressions for GI and GII. It is found that both GI and GII are very sensitive to delamination length and location through the thickness and that the magnitude of GI is also sensitive to initial imperfection. Critical loads for delamination growth are calculated based on three growth criteria. Large differences in the predictions highlight the need for a verified mixed mode delamination growth criterion. E.A.K.

N84-33525# Southwest Research Inst., San Antonio, Tex.
EVALUATION OF THE EFFECTS OF STRESS STATE AND INTERFACIAL PROPERTIES ON THE BEHAVIOR OF ADVANCED METAL MATRIX COMPOSITES Final Report
G. R. Leverant, J. E. Hack, and R. A. Page Jul. 1984 9 p
(Contract DAAG29-81-K-0049)
(AD-A143911; ARO-17207.4-MS) Avail: NTIS HC A02/MF A01 CSCL 11/4

The effects of fiber fraction, fiber orientation and matrix alloy additions on tensile and fatigue behavior were studied in commercially pure magnesium and ZE41A (Mg-4.25Zn-0.5Zr-1.25RE) that were both reinforced with FP alumina fibers. In general, axial properties were not. Off-axis loading resulted in substantial reductions in tensile and fatigue strength in the commercially pure matrix material. Although failure in tensile overload occurred along the weak fiber/matrix interface in off-axis specimens, subcritical fatigue cracks propagated parallel to the fiber direction but through the matrix. The fractographic appearance of these cracks is similar to cyclic cleavage along slip planes. The critical stress intensity for unstable fracture of off-axis material was controlled by a combination of the normal and shear stress components acting on the fiber/matrix interface. The alloying conditions in ZE41A resulted in a slight decrease in axial properties accompanied by a significant improvement in off-axis behavior. These differences were found to be a result of improved matrix and interface strengths and a decrease in fiber strength. The reaction zone product in both materials was determined to be MgO. GRA

N84-33526# Royal Aircraft Establishment, Farnborough (England).
AN EVALUATION OF THE BOEING WEDGE TEST FOR THE ASSESSMENT OF CFRP SURFACE PRETREATMENT
B. M. Parker Mar. 1984 19 p
(AD-A144050; RAE-TM-MAT/STR-1038; DRIC-BR-92280) Avail: NTIS HC A02/MF A01 CSCL 13/8

Boeing wedge specimens have been prepared from carbon fibre reinforced composites moulded against PFTE (Polytetrafluoroethylene) impregnated release cloth or silicone or PTFE release agents and pretreated by various abrasive methods. The initial crack length has been found to be related to the surface coverage by contaminant and to the strength of lap joints prepared form similar composites. Crack growth on exposure to hot-humid conditions was not a function of surface contamination. GRA

N84-33527# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.
NATURAL WEATHERING OF SELECTED ORGANIC MATRIX COMPOSITES Phase Report
E. T. Vadala and R. E. Trabocco 13 Jun. 1983 30 p
(F61-542)
(AD-A144091; NADC-82227-60) Avail: NTIS HC A03/MF A01 CSCL 11/4

A study was made of selected graphite organic matrix composite materials exposed to natural weathering at Panama and Warminster. Commercially available composite prepregs were fabricated into panels using principally a 8 ply layup (+ or 45 deg) and a 16 ply layup (0 deg + or - 45 deg 90 deg). Panels were

retrieved periodically and mechanical property determinations were made at room temperature, 82.2 deg C (180 deg F) and 121.1 deg C (250 deg F). Tension, flexure, compression, short beam shear and in-plane shear tests were primarily used to assess the damage. At room temperature, the in-plane shear strength property of the + or - 45 deg panels was unaffected by exposure. At elevated temperature, however, this matrix dominated property generally decreased with increasing exposure time. Data indicated that the combination of moisture and elevated temperature caused a decrease in the matrix dominated mechanical properties of the 16 ply panels. Some graphite organic matrix composites degraded at a faster rate than others. The use of a paint coating seemed to decrease the irreversible degradation due to moisture and ultraviolet irradiation. A one time exposure aboard different aircraft carriers was made of one of the graphite/epoxy composite systems. The static mechanical properties of the exposed panels were also degraded at the elevated temperature. GRA

N84-33528# Department of the Air Force, Washington, D.C.
DAMAGED RADAR RADOME REPAIR DEVICE Patent Application
H. E. Snyder, inventor (to Air Force) Filed 1 Jun. 1984 16 p
(AD-D011158; US-Patent-Appl-SN-616454) Avail: NTIS HC A02/MF A01 CSCL 17/9

Method and apparatus for repairing damaged tapered radar radomes. The method comprises the steps of preparing the damaged skin layers, affixing corresponding patches thereto and trimming same, where only the radome skin has been damaged, and, when both skin and core have been damaged, includes preparing the damaged skin layers and core, affixing an oversized repair core section in said prepared core, trimming the repair core section to an appropriate local configuration, affixing repair patches to the prepared skin layers and trimming same. An apparatus in practice of the present invention comprises a support affixable to the surface of the radome, at least one circumferential track device coupled to the support, at least one meridional track device coupled to the circumferential track device, and a router carriage assembly coupled to the meridional track device. A particular router device capable of precision vertical adjustment to .0005 in is also disclosed for practice with the above apparatus. GRA

N84-33529# Los Alamos Scientific Lab., N. Mex.
TEMPERATURE AND HEAT-FLUX DISTRIBUTIONS IN A STRIP-HEATED COMPOSITE SLAB
G. F. Jones 1984 19 p refs Presented at the 22nd ASME/AIChE Natl. Heat Transfer Conf., Niagara Falls, N.Y., 5-8 Aug. 1984
(Contract W-7405-eng-36)
(DE84-006016; LA-UR-84-166; CONF-840816-2) Avail: NTIS HC A02/MF A01

The steady temperature and heat flux distributions for a composite slab consisting of a strip-heated, large conductivity fin in intimate contact with a small conductivity, convectively cooled substrate are obtained. Such a problem has application to the strip heating of process equipment and laboratory experiments where uniform thermal conditions are desired and where the conductivity of the substrate is small. Analytical methods are used to obtain closed-form solutions for the local temperature and heat flux for the full, two-dimensional problem and for the boundin case of no transverse conduction within the substrate. A design procedure to determine the strip-heater spacing necessary for a prescribed maximum variation in heat flux at the convectively cooled surface is presented. An application example is given and the results discussed. Expressions for the steady temperature and heat flux are also obtained for the limiting cases of infinite heat transfer coefficient and zero-thickness substrate. DOE

N84-33496# Joint Publications Research Service, Arlington, Va.
SCALE EFFECT OF FIBER STRENGTH AND PROPERTIES OF FIBER-BASED UNIDIRECTIONAL COMPOSITES Abstract Only
Yu. G. Korabelnikov, V. P. Tamuzh, O. F. Siluyanov, V. M. Bondarenko, and M. T. Azarova *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-006) 20 Aug. 1984 p 7 Transl. into ENGLISH from Mekhan. Kompozitnykh Materialov (Riga), no. 2, Mar. - Apr. 1984 p 195-200 (For primary document see N84-33489 23-23)
Avail: NTIS HC A04/MF A01

N84-33497# Joint Publications Research Service, Arlington, Va.
DEFORMATION OF FIBER-REINFORCED LAMINATED COMPOSITE NEAR FREE SURFACE Abstract Only
A. A. Rassokha *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-006) 20 Aug. 1984 p 7-8 Transl. into ENGLISH from Mekhan. Kompozitnykh Materialov (Riga), no. 2, Mar. - Apr. 1984 p 228-232 (For primary document see N84-33489 23-23)
Avail: NTIS HC A04/MF A01

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics.*

N84-33530 Polish Academy of Sciences, Warsaw.
GENERAL CONDITION OF THE LIMITING STATE FOR ISOTROPIC MATERIALS [OGOLNY WARUNEK STANU GRANICZNEGO DLA MATERIALOW IZOTROPOWYCH]
Jerzy Podgorski 1983 22 p refs In POLISH
(ISSN-0208-5658) Copyright. Avail: Issuing Activity

A new form of condition of a limiting state for isotropic materials is proposed. Aside from its relative simplicity, this new formulation aids in the faithful description of many different isotropic materials. The proposed criterion, dependent on three stress tensor invariants, is a general condition of the limiting state for a broad class of isotropic materials, including metals, rock, concrete, and soil. The universal nature of the criterion permits a unified description of different groups of materials for the first time. Transl. by B.G.

N84-33531# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
IMPROVEMENTS IN THE PROCESS OF DEHYDRATING HYDRAZINE BY SODIUM HYDROXIDE [APRIMORAMENTOS NO PROCESSO DE DESIDRATACAO DE HIDRAZINA POR HIDROXIDO DE SODIO]
Marco Aurelio Ferreira, Isabel Cristina Coelho Calegao, and Antonio Goncalves deFreitas Jul. 1984 16 p refs In PORTUGUESE; ENGLISH summary Presented at the 36th Reuniao Anual da SBPC
(INPE-3198-PRE/561) Avail: NTIS HC A02/MF A01

The dehydrating effect of alkaline metal oxides and hydroxides on hydrazine solutions is widely discussed in the literature and many authors affirm the efficiency of sodium hydroxide as a dehydrating agent. Due to the limited liquid miscibility of sodium hydroxide - hydrazine - water systems above 60 C (for equimolarity of caustic soda and water) it is possible to eliminate the long reflux period recommended by the majority of the authors. Utilizing a reduced pressure during the fractional distillation of the mixture (with the consequent lowering of the boiling temperature) and using an inert atmosphere minimizes the risk of hydrazine vapor decomposition and explosion. The experiments described in this paper bear out the possibility of using this process to prepare hydrazine with less than 1% water with an efficiency of around 90%. Author

N84-33532 California Univ., Berkeley.
A STUDY OF THE BURNING OF A SOLID FUEL SURFACE IN PARTIAL ENCLOSURES Ph.D. Thesis
Chien-Pei Mao 1983 165 p refs
Avail: Univ. Microfilms Order No. DA8413493

Analytical and numerical methods were employed to study the steady, stationary burning and spread of flames along combustibles

solid fuel surfaces. The effects of mixed convection, finite rate chemical kinetics, and geometrical configurations on the fluid mechanical and thermal structures were examined for the physical systems for which these effects are very important. The following systems were studied: (1) steady; stationary burning of a simple flat surface under the influence of mixed convective flows; (2) steady, stationary burning of a simple flat surface including finite rate chemical kinetics; (3) steady, stationary burning of wall-ceiling and partial enclosure fires; (4) spread of flames over simple flat surfaces; and (5) spread of flames over vertical wall-ceiling surfaces. Analytical expressions of the flow structure and fundamental parameters were obtained for cases with simple geometries that accept similarity or integration solutions.

Dissert. Abstr.

N84-33533*# National Aeronautics and Space Administration, Washington, D. C.

BEHAVIOR OF Al2O3 AND SiO2 WITH HEATING IN A Cl2 + CO STREAM

L. K. Shchetinin Jul. 1984 8 p refs Transl. into ENGLISH from Izv. Vyssh. Uchsb. Zaved. Tsvetnaya Met. (USSR), no. 1, 1982 p 43-46 Transl. by Kanner (Leo) Associates, Redwood City, Calif.

(Contract NASw-3541)

(NASA-TM-77487; NAS 1.15:77487) Avail: NTIS HC A02/MF A01 CSCL 07D

Differential thermal analysis (DTA) and Thermogravimetric analysis (TGA) were used to study the chlorination of alpha-Al2O3, gamma-Al2O3 and amorphous SiO2 in a Cl + CO stream, for the preparation of AlCl3 and SiCl4. The chlorination starting temperatures were 235 deg for Al2O3 and 680 deg for SiO2. The chlorination of alpha- and gamma-Al2O3 takes place via the formation of AlOCl as an intermediate product, and its subsequent dissociation at 480 to 560 deg, according to 3AlOCl yields AlCl3 + Al2O3. The chlorination activation energies are given for the three oxides. E.A.K.

N84-33534*# Rockwell International Science Center, Thousand Oaks, Calif.

ENERGY CONVERSION AND UTILIZATION TECHNOLOGIES PROGRAM (ECUT) ELECTROCATALYSIS RESEARCH Final Report, 25 Aug. 1982 - 30 Dec. 1983

L. F. Warren Aug. 1984 33 p refs Sponsored in part by DOE Prepared for JPL

(NASA-CR-173939; JPL-9950-926; NAS 1.26:173939; DOE/CS-66001/7; SC5343.28FR) Avail: NTIS HC A03/MF A01 CSCL 07D

The general field of electrocatalysis, from both the technical and business standpoints is accessed and research areas and approaches most likely to lead to substantial energy/cost savings are identified. The overall approach was to compile and evaluate available information, relying heavily on inputs/recommendations of research managers and technical personnel in responsible positions in industry and at universities. Some promising approaches identified to date include the use of transition metal compounds as electrocatalysts and the use of the new electrochemical photocapacitance spectroscopy (EPS) technique for electrocatalyst characterization/development. For the first time, an oxygen electrocatalyst based on the K2NiF4 structure was synthesized, investigated and compared with a perovskite analog. Results show that this class of materials, based on Ni(3+), forms very efficient and stable O2 anodes in basic solution and suggest that other structure-types be examined in this regard. The very difficult problem of dinitrogen and carbon dioxide electroreductions is addressed through the use of biological model systems which can mimic the enzyme processes in nature. B.W.

N84-33535*# National Aeronautics and Space Administration, Washington, D. C.

RESEARCH ON OXIDATION BY AIR AND TEMPERING OF RANEY NICKEL ELECTROCATALYSTS FOR THE H2 ANODES OF ALKALI COMBUSTION MATERIALS CELLS Thesis - Braunschweig Technische Univ., 1982

H.-J. Selbach Aug. 1984 101 p refs Transl. into ENGLISH of German Thesis Original language document was announced as A83-18494 Transl. by Kanner (Leo) Associates, Redwood City, Calif.

(Contract NASw-3541)

(NASA-TM-77414; NAS 1.15:77414) Avail: NTIS HC A06/MF A01 CSCL 07D

The controlled oxidation in air of Raney nickel electrocatalysts was studied, with special attention paid to the quantitative analysis of nickel hydroxide. The content of the latter was determined through X-ray studies, thermogravimetric measurements, and spectral photometric examinations. The dependence of the content on the drying of activated catalyst is determined. The influence of nickel hydroxide on the electrochemical parameters of the catalyst, such as diffusion polarization, is studied, including a measurement of the exchange current density using the potential drop method. Conservation by oxidation in air with ancillary stabilization of the oxide in an H2 flow at 300 C is explored, including reduction by H2, the influence of tempering time, and structural studies on conserved and stabilized catalyst, long term research on the catalyst, including the influence of aging on the reduced catalyst, and the results of impedance measurements are presented.

C.D. (IAA)

N84-33536*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

EFFECT OF GRAVITY ON HALOGENATED HYDROCARBON FLAME RETARDANT EFFECTIVENESS

Paul D. Ronney 1984 14 p refs Presented at the 35th Congr. of the International Astronautical Federation, Lausanne, Switzerland, 7-13 Oct. 1984

(NASA-TM-83761; E-2251; NAS 1.15:83761) Avail: NTIS HC A02/MF A01 CSCL 21B

Flammability limits, burning velocities, and minimum ignition energies under initially quiescent conditions were measured for stoichiometric and fuel-lean methane-, ethane-, and propane-air mixtures containing varying concentrations of Halon 1301. The characteristics of near-limit flames were strongly affected by fuel type but not Halon concentration. The conclusions were that the mechanism of the flammability limits was affected by fuel type but not Halon concentration, that the zero-g flammability limit is probably related to a stability criterion which is affected mostly by the molecular diffusion characteristics of the reactant gases and is mostly independent of chemical kinetics, and that the one-g upward flammability and ignition limits provide adequate criteria for safety at one-g and zero-g for both uninhibited and inhibited mixtures. Author

N84-33537# King's Coll., London (England).

SPECTROSCOPIC RESEARCH AT HIGH PRESSURE AND VARIABLE TEMPERATURE Final Report, Apr. 1981 - Jun. 1984

W. F. Sherman Jun. 1984 30 p

(Contract DAJA37-81-C-0288; DA Proj. 1T1-61102-BH-57)

(AD-A143759) Avail: NTIS HC A03/MF A01 CSCL 07/4

Work concentrated on the use of spectroscopic techniques to probe material held under high pressure at various temperatures with the objective of improving understanding of intermolecular forces and the material properties which depend on them. Included in the work was the development of high pressure optical cells to extend capabilities to high temperatures (1,500K) and investigations of the use of non-spectroscopic probes. Author (GRA)

N84-33538# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Mechanical Engineering.

IGNITION AND FLAME PROPAGATION IN SPRAYS Final Report, 1 Dec. 1979 - 31 Jan. 1984

S. K. Aggarwal, N. Ashgrizzadeh, W. A. Sirignano, and S. C. Yao 10 Jul. 1984 63 p

(Contract DAAG29-80-C-0002)

(AD-A143773; ARO-17001.7-EG) Avail: NTIS HC A04/MF A01 CSCL 21/2

An experimental and numerical analysis of ignition and flame

propagation in sprays is done. A unique multi-orifice impulsed spray generator is designed and developed. This spray generator is capable of producing arrays of droplets, with controllable droplet size and spacings. Radiation effect on the droplet evaporation in spray, upstream of the flame front is studied through analytical modeling. An extensive numerical optimization study has been performed to compare the efficiency of several explicit and implicit schemes, and a numerical code has been developed to study a stabilized laminar flame in two-phase mixtures. A hybrid Eulerian-Lagrangian scheme has been developed to solve the gas and liquid phase equations. GRA

N84-33539# Chicago Univ., Ill.
EXTENSIONS OF ELECTRON STIMULATED DESORPTION MEASUREMENTS. INVESTIGATION OF GAS ADSORPTION ON Cu LAYERS DEPOSITED ON A TUNGSTEN (110) SURFACE Annual Summary Report, 1 Jul. 1983 - 30 Jun. 1984
R. Gomer 30 Jun. 1984 6 p
(Contract N00014-77-C-0018; RR0-1102)
(AD-A143779) Avail: NTIS HC A02/MF A01 CSCL 07/4

Work carried out consisted of determining energy thresholds for neutral CO, CO(+), and O(+) from chemisorbed CO on W(110) in electron stimulated desorption. Adsorption of CO and of oxygen on 1-4 Cu layers, adsorbed on a W(110) crystal were studied by thermal desorption and photoelectron spectroscopy. It has been shown that the W substrate influences adsorption behavior for several Cu layers. There are chemical shifts in both CO and Cu indicating an electron drain away from both to the underlying W. For oxygen the sticking coefficient is increased relative to bulk Cu when 1 or 2 Cu layers are adsorbed on W, but then decreases rapidly. GRA

N84-33540# Princeton Univ., N. J. Materials Lab.
COMBUSTION CHEMISTRY OF VIBRATIONALLY EXCITED OXYGEN Final Report, 1 Jan. 1982 - 31 Dec. 1983
R. B. Miles, J. Gelfand, and H. Rabitz Jul. 1984 21 p
(Contract DAAG29-82-K-0046)
(AD-A143791; ARO-18545.1-CH) Avail: NTIS HC A02/MF A01 CSCL 07/4

We are investigating the use of stimulated resonance Raman pumping to prepare oxygen in selected vibrational states of the ground electronic manifold. This necessitates the development of a laser source capable of producing radiation in the region of the Schumann-Runge transition of O2 near 200 nm. We have generated this radiation utilizing a quadrupled YAG laser shifted in a high pressure H2 Raman cell. This laser output was made tunable by employing an intracavity etalon in the YAG laser oscillator. Utilizing this source we have produced photoacoustic spectra in the Schumann-Runge band and have observed resonance fluorescence to excited vibrational states of the electronic ground state. We are currently undertaking a series of spectral measurements to determine the relative strengths of predissociation, fluorescence and resonant Raman as a function of the wavelength of the exciting laser. Author (GRA)

N84-33541# Air Force Geophysics Lab., Hanscom AFB, Mass.
REACTIONS OF NEGATIVE IONS
A. A. Viggiano and J. F. Paulson 17 Jul. 1984 26 p
(AF Proj. 2303)
(AD-A143793; AFGL-TR-84-0176) Avail: NTIS HC A03/MF A01 CSCL 07/4

This chapter provides a review of recent research on the reactions of negative ions with neutral molecules at thermal energies. Included are sections on the temperature dependence of associative detachment, vibrational excitation in associative detachment, negative ion reactions with H2S04 and N205, reactions with acetronitrile, reactions of chlorine-containing species, reactions of 02(-) and its hydrates, electron affinity determinations, isotope effects involving proton transfer, and reactions of H30(-).
Author (GRA)

N84-33542# Indiana Univ., Bloomington.
MULTIPHOTON IONIZATION MASS AND PHOTOELECTRON SPECTROSCOPY Final Report, 1 Jun. 1981 - 31 May 1984
J. P. Reilly Griffiss AFB, N.Y. RADC Jul. 1984 74 p
(Contract DAAG29-81-K-0097)
(AD-A143823; ARO-17997.14-CH) Avail: NTIS HC A04/MF A01 CSCL 07/4

The experiments that have been performed are of two types. Using a time of flight mass spectrometer, the molecular ions generated by laser ionization have been monitored. Using a time of flight photoelectron spectrometer, the kinetic energy distribution of the electrons simultaneously ejected have also been monitored. The mass spectrometric experiments can be further subdivided into two types. First, those in which samples were introduced via a capillary column gas chromatograph inlay system. Second, those involving laser ionization of molecules adsorbed to metal surfaces. Author (GRA)

N84-33543# Wisconsin Univ., Madison.
SOLIDIFICATION OF HIGHLY UNDERCOOLED LIQUID DROPLETS Final Report, 1 Sep. 1980 - 31 Oct. 1983
J. H. Perepezko 5 Jul. 1984 31 p
(Contract DAAG29-80-K-0068)
(AD-A143892; ARO-17455.10-MS) Avail: NTIS HC A03/MF A01 CSCL 07/4

The rapid solidification of highly undercooled liquid alloys in fine droplet form has been studied under controlled conditions by thermal analysis, X-ray diffraction and metallographic examination. Droplet undercooling is affected by processing variables such as particle size, melt superheat and cooling rate, but the undercooling limit is often set by a catalysis at the droplet surface. By varying the droplet coating and nucleation site the development of solidification microstructure and the effect of recalescence thermal history has been examined at controlled undercooling levels including the hypercooling range. GRA

N84-33544# Minnesota Univ., Minneapolis. Dept. of Psychology.
RAMAN SPECTROSCOPIC STUDY OF ACETYLENE ON SUPPORTED RHODIUM CATALYSTS
W. L. Parker, A. R. Siedle, and R. M. Hexter 7 Jun. 1984 21 p
(Contract N00014-77-C-0209)
(AD-A144099; TR-10; TR-32) Avail: NTIS HC A02/MF A01 CSCL 07/4

Raman spectra of acetylene on alumina supported rhodium have been measured. Analysis of these spectra indicate that a room temperature and saturation coverage the dominant surface species is sigma 2, pi C2H2. This is in striking contrast to the surface species which has been deduced for C2H2 on the single crystal faces of rhodium at these temperatures. GRA

N84-33545# Department of the Air Force, Washington, D.C.
DIHALO-MONAPHOSPHA-s-TRIAZINES AND THEIR DERIVATIVES Patent Application
K. J. L. Paciorek, inventor (to Air Force) Filed 19 Apr. 1984 14 p
(AD-D011175; US-Patent-Appl-SN-601874) Avail: NTIS HC A02/MF A01 CSCL 07/2

This invention relates in general to novel halogen substituted monophospha-s-triazine compounds and to a method for their synthesis. In a more particular manner, this invention concerns itself with a method for synthesizing halo-substituted monophospha-si-triazines by effecting a reaction between a phosphorus pentahalid and a perfluoroalkyl or a perfluoroalkylether imidoylamidine and to novel triazine compounds produced thereby. GRA

N84-33546# Department of the Air Force, Washington, D.C.
HALO-SUBSTITUTED DIPHOSPHA-s-TRIAZINES AND THEIR DERIVATIVES Patent Application
K. J. L. Paciorek, inventor (to Air Force) Filed 19 Apr. 1984 15 p
(AD-D011176; US-Patent-Appl-SN-601873) Avail: NTIS HC A02/MF A01 CSCL 07/3

This invention relates to novel halogen-substituted diphospha-s-triazines and to a method for their synthesis. In a more specific

manner, this invention relates to a method for synthesizing halogen-substituted diphospha-s-triazines by effecting a reaction between an imidodiaryl-diposphonic acid pentalhalide and a perfluoroalkyl or perfluoroalkether amidine, and to the novel disphospha-s-triazine compounds produced thereby. GRA

N84-33547# Du Pont de Nemours (E. I.) and Co., Aiken, S.C. Actinide Technology Div.
THE OXIDATION OF HYDRAZINE BY NITRIC ACID
David G. Karraker May 1984 28 p refs
(Contract DE-AC09-76SR-00001)
(DE84-015063; DP-1682) Avail: NTIS HC A03/MF A01

Hydrazine is oxidized by hot nitric acid in a first-order reaction to produce nitrogen, nitrous oxide, hydrazoic acid, and ammonium ion. Reaction half-time in 5.5M HNO3 were 1.1 h at 100 C and 8 h at 80 C. The rate law for the reaction is - d 1n (N2H4)/dt = k (NO3(-)) (H(+)) (2) where k = 5.0 x 10 (-5) M(-2) min(-1) at 100 C. The reaction was accelerated by ferric nitrate. At 80 C, reaction half-times were 0.33, 1.7, and 7 h in the presence of 0.1, 10(-2), and 10(-3) M ferric nitrate, respectively. The data are consistent with a reaction mechanism that involves steady states for reaction intermediates HN3, HNO3, and the N2H2 free radical to yield N2, N20, and NH4(+) as final products. Dissolution of plutonium metal containing appreciable (> 1%) impurities with HNO3-N2H4.HNO3-KF at elevated temperatures should be preceded by testing to assure the absence of metal ions that catalyze hydrazine oxidation. DOE

N84-33548# Midwest Research Inst., Golden, Colo.
EVALUATION OF SULFURIC ACID HYDROLYSIS PROCESSES FOR ALCOHOL FUEL PRODUCTION
John D. Wright and Carolyn G. dAgincourt Apr. 1984 121 p refs
(Contract DE-AC02-83CH-10093)
(DE84-004524; SERI/TR-231-2074) Avail: NTIS HC A06/MF A01

Three sulfuric acid hydrolysis processes (percolation, high-temperature dilute acid, and low-temperature concentrated acid) are evaluated to determine: (1) the ultimate potential of each process, (2) important research issues, and (3) the relative advantages and disadvantages of each process. The plants evaluated produce 50 million gallons of ethanol per year. The report defines a complete cellulose-to-ethanol process with sections for hydrolysis, neutralization, fermentation, and purification. A computer simulation calculates material and energy balances for the entire plant, estimates the capital cost, and computes the required ethanol selling price. The high-temperature, dilute acid process operates at approximately 240 C, uses 1% acid as the catalyst, and produces yields between 50% and 60% of theoretical. Percolation processes use lower acid concentrations and temperatures, and the reaction takes appreciably longer. The yield is increased to 75% of theoretical at the expense of production a more dilute sugar solution for fermentation. The low-temperature, high-acid concentration process has very high yields but requires significantly more acid than the other processes. DOE

N84-33549# Amherst Coll., Mass.
ISOTOPE EFFECTS IN THE SOLUTION OF GASES IN LIQUIDS Final Report, 1 Jul. 1978 - 31 May 1984
B. B. Benson and D. Krause, Jr. 31 May 1984 28 p refs
(Contract DE-AC02-78ER-05031)
(DE84-014848; DOE/ER-05031/5) Avail: NTIS HC A03/MF A01

Isotopic effects during the solution of gases were used to elucidate the processes occurring in liquids. The isotopic fractionation of helium has proven to be a particularly useful probe for the liquid state. Further information is obtained from measurements of the isotopic fractionation factors for hydrogen, nitrogen, and carbon monoxide. In addition to studies of the isotopic fractionation of solute gases the effect on the solubilities and isotopic fractionations of gases was examined when the isotopic composition of the solvent is changed. A harmonic potential model was developed for the isotopic fractionation of gases dissolved in liquids. When coupled with our experimental data, it yields values for the force constant for the interaction between the solute and the solvent, for the minimum diameter of the region or cavity in which the solute moves, and for the frequency of oscillation of the solute. The isotopic fractionation of argon during the formation of clathrate hydrates was measured at one temperature and, when interpreted in the context of the harmonic potential, the results suggest that the environment around a gas molecule in liquid water may be similar to that in the clathrate. DOE

N84-33550# California Univ., Berkeley. Lawrence Berkeley Lab. Dept. of Mechanical Engineering.
UNSTEADY HEAT TRANSFER DURING LAMINAR FLAME QUENCHING
S. R. Vosen, R. Greif, and C. Westbrook (California Univ., Livermore, Lawrence Livermore Lab.) 23 Jan. 1984 23 p refs Presented at the 20th Intern. Symp. on Combustion, Ann Arbor, Mich., 12-17 Aug. 1984
(Contracts DE-AC03-76SF-00098; W-7405-eng-48)
(DE84-006301; UCRL-90319; CONF-840801-3) Avail: NTIS HC A02/MF A01

The unsteady heat transfer to a wall during the quenching of premixed, methane-air flames was measured. One dimensional laminar flames were produced in a constant volume chamber and the heat transfer into the quenching surface was measured by a platinum thin film resistance thermometer. Predictions of the heat transfer were made with two numerical finite difference models. The results are: (1) the data are successfully correlated using the heat release rate of the flame prior to quenching; and (2) the maximum heat flux is related to the quenching distance and thus it may be possible to use measurements of the quenching distance to predict the maximum heat flux. A comparison of the experimental results and the numerical calculations revealed that a single step reaction model predicts the heat transfer and a detailed kinetics models, to within 15% of the experimental results and thermal diffusion and the chemical reaction rate of combustion are the dominant processes which determine the heat flux during quenching. DOE

N84-33551# Department of Energy, Washington, D. C.
PORE-FORMING FILLERS FOR MOLTEN CARBONATE MATRICES Patent Application
Wolfgang M. Vogel and Stanley W. Smith, inventors (to DOE) Filed 2 Nov. 1981 10 p
(Contract DE-AC02-79ET-15440)
(DE84-014509; US-Patent-Appl-SN-549380) Avail: NTIS HC A02/MF A01

A molten carbonate fuel cell is described including a cathode electrode of electrically conducting or semiconducting lanthanum containing material. An electrolyte containing matrix of an electrically insulating lanthanum perovskite is also included. In addition, in an embodiment where the cathode electrode is LaMnO3, the matrix may include LaAlO3 or a lithium containing material such as LiAlO2 or Li2TiO3. DOE

N84-33552# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
PHOTODISSOCIATION OF H2O AT 15 nm: STATE DISTRIBUTION AND SPATIAL ORIENTATION OF THE OH (x2pi) DECAY PRODUCTS Thesis [PHOTODISSOZIATION VON H2O BEI 157 MM: ZUSTANDSVERTEILUNG UND RAEUMLICHE ORIENTIERUNG DES OH (X2PI) ZERFALLPRODUKTS]
B. Titze Mar. 1984 95 p refs In GERMAN
(MPIS-5/1984; ISSN-0436-1199) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 17,10

The dissociation of H2O after optical excitation was investigated and the OH fragment resulting from this process was studied with laser induced fluorescence concerning its state specific aspects and spatial orientation. The overshoot energy of 2.89 eV is found to be distributed between the degrees of freedom translation, vibration, and rotation as 0.885 : 0.095 : 0.02. The rotational distribution of OH shows a strong dependence on the rotational temperature of H2O (Trot (H2O)). A doublet inversion sensitively depending on the Trot (H2O) and on the OH rotation

impulse is measured. The polarization ratio also depends on these two parameters. For doublet inversion population and polarization ratio, good agreement is found between mathematical models and experimental data. Author (ESA)

N84-33553# Bayer A.G., Leverkusen (West Germany). Zentralbereich IN AP-TP 2.
DEVELOPMENT OF PARTICLE SIZING FOR HIGHLY CONCENTRATED COLLOIDAL DISPERSIONS USING PHOTON CORRELATION SPECTROSCOPY Final Report, Sep. 1982
Joachim Wagner Bonn Bundesministerium fuer Forschung und Technologie Jun. 1984 168 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-117; ISSN-0340-7608) Avail: NTIS HC A08/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 33,50

A fiber optics spectrometer to determine particle sizes for very high concentrations was developed. Data acquisition and interpretation are conventional. The apparent systematic deviations of the particle diameter - evaluated from the diffusion coefficient - from the real particle size as a function of particle concentration is due to particle-particle-interaction up to high concentrations. This technique can measure particle diffusion coefficients even in very high concentrated colloidal dispersions. Author (ESA)

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N84-33554 Polish Academy of Sciences, Warsaw.
MICROSCOPIC STUDIES OF ACCELERATED DESTRUCTION OF PLASTIC CONTACT IN KINEMATIC PAIRS FROM DIFFERENT METALS [BADANIA MIKROSKOPOWE PRZYSPIESZONEGO NISZCENIA STYKU PLASTYCZNEGO W PARACH KINEMATYCZNYCH Z ROZNYCH METALI]
Edward Romanowski 1983 27 p In POLISH
(ISSN-0208-5658) Copyright. Avail: Issuing Activity

The process of accelerated destruction of plastic contact is illustrated using aluminum alloy PA-2, electrolytic silver, bearing steel, and toughened and nitrided 38HMJA alloy steel. Studies are conducted using the Cambridge Stereoscan electron microscope. The findings indicate that the rise in temperature during contact is not a necessary condition for the mashing of plastic metals at a normal environmental temperature. Necessary conditions include: the operation of pressure force and friction force in the contact; plastic pre-springing of the contact; and blockage and shearing of the surface layer of the plastic contact. The destruction of plastic contact is illustrated in 22 drawings. Author

N84-33555* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
OVERLAY METALLIC-CERMET ALLOY COATING SYSTEMS Patent
Michael A. Gedwill, Stanley R. Levine, and Thomas K. Glasgow, inventors (to NASA) Issued 1 May 1984 7 p Filed 30 Jul. 1982 Supersedes N82-33522 (20 - 24, p 3413)
(NASA-Case-LEW-13639-1; NAS 1.71:LEW-13639-1; US-Patent-4,446,199; US-Patent-Appl-SN-403378; US-Patent-Class-428-639; US-Patent-Class-428-564; US-Patent-Class-428-678; US-Patent-Class-416-241R) Avail: US Patent and Trademark Office CSCL 11F

A substrate, such as a turbine blade, vane, or the like, which is subjected to high temperature use is coated with a base coating of an oxide dispersed, metallic alloy (cermet). A top coating of an oxidation, hot corrosion, erosion resistant alloy of nickel, cobalt, or iron is then deposited on the base coating. A heat treatment is used to improve the bonding. The base coating serves as an inhibitor to interdiffusion between the protective top coating and the substrate. Otherwise, the protective top coating would rapidly interact detrimentally with the substrate and degrade by spalling of the protective oxides formed on the outer surface at elevated temperatures.
Official Gazette of the U.S. Patent and Trademark Office

N84-33556 Georgia Inst. of Tech., Atlanta.
THE INFLUENCE OF GRAIN STRUCTURE, TESTING TEMPERATURE AND ENVIRONMENT ON THE MONOTONIC AND LOW CYCLE FATIGUE BEHAVIOR OF A HIGH STRENGTH ALUMINUM-COPPER-LITHIUM ALLOY Ph.D. Thesis
Srivatsan Srinivas Tirumalai 1984 217 p
Avail: Univ. Microfilms Order No. DA8412621

The increasing need for higher speed, maneuverability, durability and reduced fuel consumption are factors which forced the aerospace industry to develop high-strength, light weight materials for aerospace structures. Aluminum alloys which were successfully in these structures, can meet the above requirements with additions of small amounts of lithium. The emergence of Aluminum-Lithium alloys as attractive candidate materials, has created a need for evaluating their mechanical response. To support this need, the effect of grain structure on the monotonic and fatigue behavior of this alloy was determined at temperatures 298 K and 433 K, and in both air and vacuum environments. The 2020 variants had partially recrystallized and unrecrystallized microstructure. A special thermomechanical processing technique was used to produce the unrecrystallized structure. Dissert. Abstr.

N84-33557 California Univ., Berkeley.
PROCESS MODELING OF SHEET METAL FORMING OF GENERAL SHAPES BY THE FINITE ELEMENT METHOD BASED ON LARGE STRAIN FORMULATION Ph.D. Thesis
Chin Hoi Toh 1983 235 p
Avail: Univ. Microfilms Order No. DA8413604

Process modeling of axisymmetric and non-axisymmetric sheet metal forming operations was carried out using the rigid-plastic finite element method based on membrane theory. The sheet materials were assumed to possess normal anisotropy and to obey Hill's anisotropic yield criterion and its associated flow rule. The formulation took into account finite strain and isotropic workhardening phenomena during deformation. Triangular elements with linear displacement functions were used for the discretized sheet domain. A constant frictional condition was assumed to exist between the forming tools and sheet metals. The axisymmetric punch stretching process was analyzed in order to examine the validity of the proposed finite element formulation. The results confirmed the applicability of the newly developed finite element computer code. Further justification was made by the simulation of an axisymmetric deep drawing process. The computed results were consistent with the existing solutions. Dissert. Abstr.

N84-33558 Case Western Reserve Univ., Cleveland, Ohio.
INFLUENCE OF COBALT, TANTALUM AND TUNGSTEN ON THE HIGH TEMPERATURE MECHANICAL PROPERTIES OF SINGLE CRYSTAL NICKEL-BASE SUPERALLOYS Ph.D. Thesis
Michael Victor Nathal 1984 236 p
Avail: Univ. Microfilms Order No. DA8424065

The influence of composition on the microstructure and mechanical properties of nickel-base superally single crystals was investigated. Cobalt, tantalum, and tungsten concentrations were varied according to a matrix of compositions based on the single crystal version of MAR-M247. Tensil and creep rupture tests on <001> oriented single crystals were performed at 1000 C. The microstructures were examined using optical and electron microscopy, differential thermal analysis, X-ray diffraction, and phase extraction. Dissert. Abstr.

N84-33559 Columbia Univ., New York.
LONG-TERM CREEP OF COPPER AT CRYOGENIC TEMPERATURES Ph.D. Thesis
Chin-Tang Yen 1984 88 p
Avail: Univ. Microfilms Order No. DA8413044

The creep behavior of OFHC copper at cryogenic temperatures (4.2K to 90K) using long-term creep testing which was rarely

adopted in the past is studied. Most prior studies are based on short term creep tests and produce only transient stage creep results. Equipment and procedures were designed with particular attention given to the maintaining of constant cryogenic temperature and to the stability and sensitivity of strain measurement over hundreds of hours. Mechanical strain of .000001 resolution and + or - 1K temperature stability was achieved. A capacitance strain gage system was adopted in addition to the resistance strain gage system for the purpose of conducting creep tests at high stress levels. The agreement between these two independent systems confirms the accuracy and reliability of the tests. Dissert. Abstr.

N84-33560 Minnesota Univ., Minneapolis.
THE EFFECT OF INTERNAL HYDROGEN ON NEAR-THRESHOLD FATIGUE CRACK PROPAGATION IN IRON BASE SYSTEMS Ph.D. Thesis
Khlefa Alarbe Esaklul 1984 264 p
Avail: Univ. Microfilms Order No. DA8413774

The effect of internal hydrogen on near-threshold fatigue crack propagation behavior of low strength HSLA steel, ultrahigh strength AISI 4340 steel, iron and three iron-silicon alloys was studied. The objectives were to determine the extent of hydrogen effect on near threshold fatigue crack propagation, threshold stress intensities and crack closure. Fatigue crack propagation testing was accomplished using standard compact tension specimens at a frequency of 30 Hz and load ratios of 0.1, 0.35 and 0.7. Hydrogen was introduced by means of cathodic charging prior to testing. The results indicate that internal hydrogen has substantial effects on crack propagation rates as well as threshold stress intensities. Crack closure is playing a major role in determining the extent of hydrogen effects and in several instances it suppressed these effects. However, when closure was substracted by evaluating the data in terms of effectiveness stress intensity, hydrogen effects were evident in all cases. Dissert. Abstr.

N84-33561 Carnegie-Mellon Univ., Pittsburgh, Pa.
THE ROLE OF HYDROGEN IN THE STRESS CORROSION CRACKING OF 7XXX-SERIES ALUMINUM ALLOYS Ph.D. Thesis
Robert Edward Swanson 1984 174 p
Avail: Univ. Microfilms Order No. DA8414756

The role of hydrogen on the stress corrosion cracking behavior of a high-strength powder metallurgy (PM) aluminum alloy was investigated. Aging treatments were used to produce various microstructures, which were shown to differ in types of precipitate as well as in precipitate-free zone width. Stress corrosion cracking data were generated using constant load and constant extension rate tests, employing cathodic precharging and straining electrode techniques, as well as the loading mode method to distinguish between hydrogen and dissolution contributions to SCC. In addition, SCC velocity data were obtained using fracture mechanics techniques. The resistance to crack propagation by a hydrogen component to SCC, as well as to SCC propagation in general, was shown to increase gradually with aging. Since several microstructural features are changing simultaneously during aging, no single feature was correlated with this change in propagation behavior. The resistance of 7090 to SCC initiation, as well as to initiation by a hydrogen contribution, was shown to be about the same for underaged and peak aged microstructures but greatly increased with overaging. Dissert. Abstr.

N84-33562# Royal Aircraft Establishment, Farnborough (England).
POWDER METALLURGY FOR THE ECONOMICAL MANUFACTURE OF AERONAUTICAL COMPONENTS IN TITANIUM ALLOY
J. Devillard Apr. 1983 27 p refs Transl. into ENGLISH from Materiaux et Tech. (France), no. 69, ot, 10-11, 1981 p 373-382
(AD-B076255; RAE-Trans-2106; BR88809) Avail: NTIS HC A03/MF A01

The conditions required for producing reproducible sintered parts in Ti alloys are given and the four principal technologies used are outlined. An economic study is made of the PSV (pulverization uner vacuum) process which involves electron bombardment of a fast turning alloy electrode under vacuum to produce fine droplets which solidify to small spheres. A unit capable of producing 100 tonnes of powder per year is described. Processes (e.g., hydrostatic compression) for the densification of Ti alloy powders are considered with special reference to costs. Some of the mechanical properties of PSV Ti alloys sintered by hot isostatic compression are presented. Author

N84-33563*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
HIGH-PRESSURE HYDROGEN TESTING OF SINGLE CRYSTAL SUPERALLOYS FOR ADVANCED ROCKET ENGINE TURBOPUMP TURBINE BLADES
Wendy S. Alter, Richard A. Parr, Mary H. Johnston, and Joseph P. Strizak Aug. 1984 15 p refs
(NASA-TM-86464; NAS 1.15:86464) Avail: NTIS HC A02/MF A01 CSCL 11F

A screening program to determine the effects of high pressure hydrogen on selected candidate materials for advanced single crystal turbine blade applications is examined. The alloys chosen for the investigation are CM SX-2, CM SX-4C, Rene N-4, and PWA1480. Testing is carried out in hydrogen and helium at 34 MPa and room temperature, with both notched and unnotched single crystal specimens. Results show a significant variation in susceptibility to Hydrogen Environment Embrittlement (HEE) among the four alloys and a marked difference in fracture topography between hydrogen and helium environment specimens. M.A.C.

N84-33564*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LOW CYCLE FATIGUE BEHAVIOR OF CONVENTIONALLY CAST MAR-M 200 AT 1000 DEG C
Walter W. Milligan (Georgia Inst. of Technology) and Robert C. Bill Sep. 1984 15 p refs
(NASA-TM-83769; E-2260; NAS 1.15:83769; USAAVSCOM-TR-84-C-16) Avail: NTIS HC A02/MF A01 CSCL 11F

The low cycle fatigue behavior of the nickel-based superalloy MAR-M 200 in conventionally cast form was studied at 1000 C. Continuous cycling tests, without hold times, were conducted with inelastic strain ranges of from 0.04 to 0.33 percent. Tests were also conducted which included a hold time at peak strain in either tension or compression. For the conditions studied, it was determined that imposition of hold times did not significantly affect the fatigue life. Also, for continuous cycling tests, increasing or decreasing the cycle frequency did not affect life. Metallographic analysis revealed that the most significant damage mechanism involved environmentally assisted intergranular crack initiation and propagation, regardless of the cycle type. Changes in the gamma morphology (rafting and rod formation) were observed, but did not significantly affect the failure. Author

N84-33565*# Textron Bell Aerospace Co., Buffalo, N. Y. Electroforming Operations Dept.
STUDY OF HIGH PERFORMANCE ALLOY ELECTROFORMING Monthly Technical Progress Narrative, 27 Aug. - 29 Sep. 1984
G. A. Malone 11 May 1984 8 p
(Contract NAS8-35817)
(NASA-CR-173979; NAS 1.26:173979; MTPN-9) Avail: NTIS HC A02/MF A01 CSCL 11F

Nickel-manganese electroformed specimens and nickel-cobalt-manganese samples were heat treated at 343 C (650 F) for comparison of room temperature ductility with that observed for alloys heat treated at 315.6C (600 F). All heat treatments were for 24 hours. This heat treatment temperature increase generally did not result in significant improvements in ductility. However, increases in yield strength - with slight decreases in tensile strengths - were noted for the nickel-manganese and nickel-cobalt-manganese alloys. For the case of employing fairly high manganese contents in the electrolyte and countering ensuing high tensile stress in the alloy by saccharin additions to the bath, it was noted that nickel-manganese alloys with over 0.4% by weight manganese retained high ultimate and yield strengths after the 343 C (650 F)

heat treatment for 24 hours. Elongations were still lower than desired. For alloys with less than 0.4% by weight manganese this heat treatment provided excellent ductility, but very significant reductions in ultimate and yield strengths were noted. R.J.F.

N84-33566*# Battelle Columbus Labs., Ohio.
THE INFLUENCE OF CONTAINERLESS UNDERCOOLING AND RAPID SOLID-STATE QUENCHING ON THE SUPERCONDUCTIVE AND MAGNETIC PROPERTIES OF SOME CLUSTERING ALLOY SYSTEMS Quarterly Technical Progress Report, period ending 10 Aug. 1984
E. W. Collings 10 Aug. 1984 18 p
(Contract NAS8-35145)
(NASA-CR-171144; NAS 1.26:171144; QTPR-7) Avail: NTIS HC A02/MF A01 CSCL 11F

The properties of clustering alloy systems and the manner in which they are influenced by rapid quenching from a containerless undercooled melt are discussed. It was postulated that rapid quenching under such conditions would result in highly disordered metastable alloys, and furthermore, that alloys in such conditions would possess physical properties characteristically different from those of alloys in the annealed equilibrium state. The scope of the program is essentially to gauge the influence of containerless undercooling on the submicrostructure of clustering-type alloys, using certain physical properties as diagnostic tools. Microstructures and macrostructures were to be examined using optical- and scanning-electron microscopy. R.J.F.

N84-33567# Army Armament Research and Development Command, Watervliet, N. Y. Large Caliber Weapon Systems Lab.
EMBRITTLEMENT OF 4340 TYPE STEEL BY LIQUID LEAD AND ANTIMONY AND LEAD-ANTIMONY SOLUTIONS Final Report
M. H. Kamdar May 1984 24 p Presented at 1982 meeting of AIME, St. Louis, 24-28 Oct. 1982
(AD-A143785; AD-E440248; ARLCB-TR-84017) Avail: NTIS HC A02/MF A01 CSCL 11/6

A study has been made of the fracture behavior of single-edge notched specimens of 4340 type steel tested in cyclic fatigue at temperatures ranging from 675 F to 1350 F in high purity lead and antimony and liquid lead containing 5 to 75 percent antimony in solution. The susceptibility to embrittlement by liquid lead decreases with temperature. The fracture mode changes from intergranular at low temperatures to ductile at 1200 F. In lead solutions, at low temperatures (700 F) and low concentrations of antimony (5 to 25 percent), embrittlement is caused by liquid lead only. At high temperatures (1000 to 1200 F) and high concentrations of antimony (35 to 75 percent Sb), antimony is the primary embrittling species. Antimony induced embrittlement by lead-antimony solutions occurs by intergranular fracture mode. This variation in susceptibility to embrittlement with temperature indicates that at low temperatures embrittlement is caused by liquid lead and occurs by reduction in cohesion mechanism; while at elevated temperatures embrittlement is induced by antimony and occurs by temperature dependent grain boundary diffusion controlled processes. These and other results are also discussed in terms of the current understanding of liquid metal and temper embrittlement of metals. GRA

N84-33568# Ultramet, Pacoima, Calif.
PLATINUM GROUP COATINGS FOR REFRACTORY METALS Final Report, Oct. 1983 - Apr. 1984
J. T. Harding, R. H. Tuffias, and R. B. Kaplan Jun. 1984 14 p
(Contract F04611-83-C-0055)
(AD-A143792; AFRPL-TR-84-035) Avail: NTIS HC A02/MF A01 CSCL 11/3

Oxidation resistant coatings of iridium on rhenium substrates have been produced by chemical vapor deposition from an iridium acetyl acetonate starting compound. The process results in rapid buildup of iridium. Heat treatment to near the melting point of iridium causes the iridium to wet and diffuse into the rhenium surface eliminating porosity and assuring good bonding. These coatings have provided oxidation resistance at temperatures of 1850 C in air. After twenty minutes there was no evidence of deterioration. Author (GRA)

N84-33569# Imperial Coll. of Science and Technology, London (England). Lubrication Lab.
EVALUATION OF SERVICE LUBRICANTS AND METALS CORRELATION OF BENCH TESTS WITH ENGINES Final Technical Report
T. Nonaka and A. Cameron Jun. 1984 63 p
(Contract DAJA45-83-C-0001; DA Proj. 1T1-61102-BH-57)
(AD-A143971) Avail: NTIS HC A04/MF A01 CSCL 11/6

The object of the work, to devise a test that enables engine lubrication to be correlated by the High Frequency Reciprocating (HFR) test apparatus, recently developed in the Lubrication Laboratory of Imperial College, has been successfully completed. Oils whose performance were evaluated in the full scale 240 hour diesel scuffing test, 6V 53T, have been tested. Calcium detergent was found to have a considerable effect on wear. Most of the additives tested gave a surface film characterized by a high electrical contact resistance, ECR, which may reach 106 ohms. When it is present, there is very little or no wear. It is broken down mainly by temperature but also by load, with consequent increase of wear. The project was primarily concerned with the influence of lubricants on engines, so standard engine liners were used. Some tests, however, clearly demonstrated the importance of liner metallurgy and liner finish. This subject would repay further study. The importance of combustion atmosphere is briefly discussed. GRA

N84-33570# Department of the Air Force, Washington, D.C.
METHOD FOR REFINING MICROSTRUCTURES OF PREALLOYED POWDER METALLURGY TITANIUM ARTICLES Patent Application
D. Eylon, inventor (to Air Force) Filed 5 Jun. 1984 11 p
(AD-D011162; US-Patent-Appl-SN-617445) Avail: NTIS HC A02/MF A01 CSCL 11/6

A method for improving the microstructure of an article made by powder metallurgy of prealloyed titanium powder which comprises beta-solution heat treating the article at a temperature approximately equal to the beta-transus of the equivalent alloy, rapidly cooling the article, annealing the article at a temperature about 10 to 20% below the beta-transus and air cooling to room temperature. The resulting article has a fine alpha plate structure in a matrix of discontinuous beta phase. Author (GRA)

N84-33571# Department of the Air Force, Washington, D.C.
METHOD FOR REFINING MICROSTRUCTURES OF BLENDED ELEMENTAL POWDER METALLURGY TITANIUM ARTICLES Patent Application
D. Eylon, inventor (to Air Force) Filed 5 Jun. 1984 11 p
(AD-D011177; US-Patent-Appl-SN-617447) Avail: NTIS HC A02/MF A01 CSCL 11/6

A method for improving the microstructure of an article made by powder is described metallurgy of blended elemental titanium powder which comprises beta-solution heat treating the article at a temperature approximately equal to the beta-transus of the equivalent alloy, rapidly cooling the article, annealing the article at a temperature about 10 to 20% below the beta-transus and air cooling to room temperature. The resulting article has a fine alpha plate structure in a matrix of discontinuous beta phase.
Author (GRA)

N84-33572# Oak Ridge National Lab., Tenn. Metals and Ceramics Div.
FATIGUE BEHAVIOR AT 650 DEG OF 20 PERCENT-COLD-WORKED TYPE 316 STAINLESS STEEL IRRADIATED AT 550 DEG C IN THE HFIR
M. L. Grossbeck and K. C. Liu 1984 23 p refs Presented at the 12th Intern. Symp. on Effects of Radiation on Mater., Williamsburg, Va., 18 Jun. 1984
(Contract DE-AC05-84OR-21400)
(DE84-014269; CONF-840604-9) Avail: NTIS HC A02/MF A01

Type 316 stainless steel in the 20% cold worked condition

was irradiated in the High Flux Isotope Reactor (HFIR) and subsequently tested in fatigue. The specimens were irradiated at 550 C to damage levels of 8 to 12 dpa and transmutation helium levels of 300 to 500 at. ppM. Fatigue testing at 650 C revealed that cyclic life was not significantly affected by the irradiation. However, unlike the results of tests of the same material at 550 C, no endurance limit was observed. The absence of an endurance limit is interpreted in terms of thermal creep. DOE

N84-33573# Massachusetts Inst. of Tech., Cambridge. Dept. of Materials Science and Engineering.
ON THE HIERARCHY OF INTERFACIAL DISLOCATION STRUCTURE
R. W. Balluffi and G. B. Olson May 1984 59 p refs
(Contract DE-AC02-78ER-05002)
(DE84-014160; DOE/ER-05002/41) Avail: NTIS HC A04/MF A01

Many different types of dislocations have been defined in dislocation models for grain boundaries and interphase boundaries. It is emphasized that there is no unique dislocation model for a boundary, and that the formal dislocation content depends upon the choice of the lattice correspondence relating the adjoining lattices. Best, or most useful, descriptions often exist, and these are discussed. A hierarchy consisting of four different types of interfacial dislocations may be distinguished: (1) primary interfacial dislocations; (2) secondary interfacial dislocations; (3) coherency interfacial dislocations; and (4) translation interfacial dislocations. While there may be a lack of agreement on terminology in the literature, it is believed that these dislocation types are distinguishable and play unique roles in useful dislocation models for interfaces. Detailed descriptions of these dislocation types are given, and actual examples in real interfaces are presented. It is concluded that dislocation descriptions of interface structures are only of formal significance in the limit of fully incoherent interfaces since the cores are then delocalized. The utility of various dislocation descriptions therefore depends on the degree to which various types of local coherency exist. DOE

N84-33574# Department of Energy, Washington, D. C.
CLAD CAST STEEL STRIP Patent Application
Ralph L. Sheneman, inventor (to DOE) Filed 1 Nov. 1983 21 p Sponsored by DOE
(DE84-014245; US-Patent-Appl-SN-547682) Avail: NTIS HC A02/MF A01

A process for producing continuous cast hot band crystalline metal strips comprising feeding thin gauge metal strips and molten metal into a gap formed between opposed quenching surfaces is detailed. The film of molten metal is cooled while in contact with the quenching surface to establish a bond between the strips. Most preferably, the metal strips are steel. The melt to solid ratio should be above about 4.2 and most preferably is maintained at about 5.0. DOE

N84-33575# Department of Energy, Washington, D. C.
DUCTILE ALUMINIDE ALLOYS FOR HIGH TEMPERATURE APPLICATIONS Patent Application
Chain T. Liu and James O. Stiegler, inventors (to DOE) Filed 21 Dec. 1983 14 p
(Contract DE-AC05-84OR-21400)
(DE84-014317; US-Patent-Appl-SN-564108) Avail: NTIS HC A02/MF A01

Improved Ni3Al alloys are provided by inclusion of boron, hafnium or zirconium, and in some species, iron. These improved alloys maintain high strength and resist oxidation at high temperatures. The tensile properties and creep properties were examined. Author

N84-33576# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
CRITICAL CURRENT DENSITY OF BRONZE-PROCESSED MULTIFILIMENTARY Nb-3Sn WIRES WITH MAGNESIUM ADDITION TO THE MATRIX
I. W. Wu, D. R. Dietderich, P. E. Johnson-Walls, J. Glazer, J. T. Holthius, W. V. Hasssenzahl, and J. W. Morris, Jr. Aug. 1983 11 p refs Presented at the Cryog. Eng. Conf., Colorado Springs, 15-19 Aug. 1983
(Contract DE-AC03-76SF-00098)
(DE84-014579; LBL-16527; CONF-830841-37) Avail: NTIS HC A02/MF A01

The effects of the addition of magnesium to the bronze of a bronze-processed multifilamentary Nb3Sn conductor were studied. The bronze composition was varied from Cu-6.7Sn-0.0Mg to Cu-6.7Sn-0.62Mg. The magnesium was found to refine the Nb3Sn grain size and improve the critical current density of the superconductor. The most heavily doped wire had an optimum critical current density three to six times better than the Mg-free control wire at all fields. DOE

N84-33577# Brown Univ., Providence, R. I. Div. of Engineering.
COMBINED MACROSCOPIC AND MICROSCOPIC APPROACH TO THE FRACTURE OF METALS Annual Progress Report, 1983-1984
R. J. Asaro, J. Gurland, A. Needleman, and C. F. Shih Jul. 1984 63 p
(Contract DE-AC02-80ER-10556)
(DE84-014670; DOE/ER-10556/101) Avail: NTIS HC A04/MF A01

A finite element study of the strain hardening of a simple composite model was conducted which shows that the work hardening behavior can be understood by the effects of geometric and material properties on the development of slip regions. The fracture of dual-phase steels is now being treated theoretically by examining models for the description of the limits of ductilities in uniform elongation and post-uniform elongation. Detailed studies continue on the effects of tempering on aluminum and titanium-killed steels. A new correlation is shown between measured K/sub IC/ values and those calculated using a model based on a criteria of critical strains achieved over a critical distance, the former being identified with the measured plane strain ductility, the latter with the average particle spacing. Work on the role of hydrogen in the fracture of steels has been carried out on initially smooth and circumferentially notched specimens of a 1015 steel modified with Mn. Finite element studies of notched bend specimens have been carried out which exhibit the large strains and localized shearing modes in the highly deformed notch tip region often observed in high strength steels. DOE

N84-33578# Hanford Engineering Development Lab., Richland, Wash.
FRACTURE TOUGHNESS OF IRRADIATED HT-9
F. H. Huang May 1984 9 p refs
(Contract DE-AC06-76FF-02170)
(DE84-013935; HEDL-7458) Avail: NTIS HC A02/MF A01

Compact tension specimens of HT-9 from the AD-2 recon experiment were tested at 205 C. Specimens of base metal have two different grain sizes: ASTM 8-9 and ASTM 3-4. One specimen of weld metal was also tested at 205 C. Test results showed that the fracture toughness of HT-9 with a larger grain size was lower and the toughness degradation due to high fluences was more severe for the HT-9 weld metal than for the base metal. DOE

N84-33579# General Electric Co., Schenectady, N. Y. Advanced Energy Programs Dept.
LONG TERM MATERIALS TEST PROGRAM Quarterly Report, Oct. - Dec. 1983
1984 32 p
(Contract DE-AC21-79ET-15457)
(DE84-014791; DOE/ET-15457/1575) Avail: NTIS HC A03/MF A01

The long term exposure of gas turbine vane and blade base alloys and a variety of protective coating systems to the effluent from a pressurized fluidized bed coal combustor is investigated after 4398 hours. After 4053 hours, FeCrAlY overlay coatings and platinum/rhodium-aluminide pack diffusion coatings show excellent resistance to corrosion attack at 1500(0)F. Cobalt-base coatings are somewhat more susceptible to hot corrosion, and the un-

protected nickel and cobalt-base alloys are most susceptible to corrosion, although corrosion rates have decreased to less than 1 mil/1000 hours for all materials at 1500(0)F. The three-stage cyclone cleanup system became severely distorted after approximately 5600 hours total service life. Distortion of the cyclones contributed to an increased dust loading to the material test sections, 110 to 250 ppM versus normal loadings of 30 to 90 ppM, for a period of about 75 hours. This increase in dust loading caused severe erosion of the airfoils in the high-velocity test section. A new three stage cyclone system is installed and dust loadings now range from 15 to 45 ppM. DOE

N84-33580# California Univ., Santa Barbara.
RESEARCH ON PHASE TRANSFORMATIONS AND NON-EQUILIBRIUM PROCESS Progress Report
1984 8 p
(Contract DE-AT03-82ER-12063)
(DE84-014376; DOE/ER-12063/T1) Avail: NTIS HC A02/MF A01

Progress is reported on a boundary layer model of dendritic solidification, impurity effects in dendritic growth, propagation pattern selection, directional solidification, and rippled phase of biomembranes. DOE

N84-33581# Oak Ridge National Lab., Tenn. Metals and Ceramics Div.
A MODIFIED TRITIUM TRICK TECHNIQUE FOR DOPING VANADIUM ALLOYS WITH HELIUM
D. N. Braski and D. W. Ramey 1984 31 p refs Presented at the 12th Intern. Symp. on Effects of Radiation on Mater., Williamsburg, Va., 18 Jun. 1984
(Contract DE-AC05-84OR-21400)
(DE84-014267; CONF-840604-11) Avail: NTIS HC A03/MF A01

A modified tritium trick technique was used to implant three different levels of (3)He in V-15Cr-5Ti (wt %) and Vanstar-7 specimens before irradiation in the Fast Flux Test Facility. The modifications include: (1) wrapping of the specimens with tantalum foil to minimize oxygen contamination; and (2) a 400 C decay time treatment to prevent vanadium tritide formation and to produce a (3)He bubble distribution similar to that produced during elevated temperature irradiation. Preliminary results show that both modifications were successful. Vanstar-7 specimens consistently absorbed about half as much tritium, and subsequently contained half as much (3)He as V-14Cr-5Ti. Implanting (3)He in vanadium alloys via the tritium trick offers a convenient technique to study the mechanism of helium embrittlement without irradiation and should provide a rapid screening method to help develop embrittlement resistant vanadium alloys. DOE

N84-33582# Department of Energy, Washington, D. C.
METHOD OF GAS PURIFICATION AND SYSTEM THEREFORE Patent Application
Raphael Szwarc, inventor (to DOE) Filed 29 Dec. 1983 18 p
(Contract DE-AC04-76DP-00656)
(DE84-014322; US-Patent-Appl-SN-566621) Avail: NTIS HC A02/MF A01

A method and device are disclosed for conducting gettering. The gettering is conducted with one of an LiB, LiSi or LiAl system. Preferably the LiB system is of the formula Li(x)B(1-x) wherein $0 < x < 1$ with gettering conducted at room or slightly elevated temperature of about 100 to 200 C. DOE

N84-33583# National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.
ENGINEERING PROPERTY COMPARISONS OF POWDER METALLURGY (PM) ALLOY X7901-T7E69 AND INGOT METALLURGY (IM) ALLOY FORGINGS
L. Schra Jun. 1984 15 p ref Document previously announced as N84-24782
(Contract NIVR-1743)
(NLR-MEMO-SM-83-050-U; NLR-TR-82054-U-Add) Avail: NTIS HC A02/MF A01

Fracture toughness and stress corrosion tests of aircraft aluminum alloys are summarized. Considerably better resistance to crack extension of the IM alloys 7075-T73 and 7050-T736 as compared to the PM alloy X7091-T7E69 is found in the fracture toughness tests for the same test orientation as applied in spectrum fatigue tests. This may be (part of) the explanation for the early static crack extension and the low fatigue crack propagation life with flight simulation loading of PM alloy X7091-T7E69 specimens. The stress corrosion tests under atmospheric conditions show a higher resistance to stress corrosion cracking for the PM alloy X7091-T7E69 than for the IM alloys. Author (ESA)

N84-33584# Kernforschungsanlage, Juelich (West Germany). Inst. fuer Reaktorwerkstoffe.
CONTRIBUTION OT THE HIGH TEMPERATURE DEFORMATION BEHAVIOR OF THE AUSTENITIC STEEL 1.4981 AFTER NEUTRON IRRADIATION
B. A. Thiele, F. Svchubert, and H. Nickel Mar. 1984 111 p refs In GERMAN; ENGLISH summary
(JUEL-1904; ISSN-0366-0885) Avail: NTIS HC A06/MF A01

Radiation effects on austenitic steel 1.4981 are discussed. Neutron fluxes of 1.55 times 10 to the 23rd power to 3 times 10 to the 25th power were applied at temperatures of 400 to 500 C. Helium embrittlement was determined in postirradiation tensile and stress rupture tests at temperatures of 400 to 850 C. A high production of helium within the grains leads to ductility loss controlled by the diffusion of helium. Below 700 C the rupture elongation after irradiation is proportional to the ductility of unirradiated material which is in turn dependent on the thermomechanical treatment. Numerous intercrystalline microcracks normally orientated to the stress direction are found. The elongation results mainly from the widening of the microcracks; the grains themselves are not elongated to the same extent as in unirradiated specimens. Little or no secondary creep is observed for irradiated specimens. Author (ESA)

N84-33585# European Space Research and Technology Center, Noordwijk (Netherlands).
THE CORROSION PROPERTIES OF SPACELAB STRUCTURAL ALLOY ALUMINUM 2219-T851
B. D. Dunn Paris ESA May 1984 99 p refs
(ESA-STR-212; ISSN-0379-4067) Avail: NTIS HC A05/MF A01

The corrosion protection systems and wrought alloy selected for Spacelab 2219 applications were subjected to surface corrosion and stress corrosion salt spray tests or immersion in 3.5% sodium chloride solution. Results demonstrate that all chemically oxidized surfaces must be finished with space approved paints to avoid corrosion. Anodized finishes are expected to survive the Spacelab 10 year life requirement. Forged ring, rolled plate and welded plate (TIG, electron beam and repaired) 2219-T851 passes standard stress corrosion tests. Samples were stressed in the short transverse direction, at 75% of the 0.2% proof stress, for at least 30 days. The alloy BS L 93 (equivalent to AA 2024) was simultaneously tested and failed the ESA stress corrosion requirements. Author (ESA)

N84-33469# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Stuttgart (West Germany).
TOWARDS A CYCLE WITHOUT LOSS: COBALT IN THE AIRCRAFT INDUSTRY
C. Voigt *In* AGARD Mater. Substitution and Recycling Apr. 1984 7 p refs (For primary document see N84-33465 23-23)
Copyright. Avail: NTIS HC A13/MF A01

N84-33471*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
UNDERSTANDING THE ROLES OF THE STRATEGIC ELEMENT COBALT IN NICKEL BASE SUPERALLOYS
Joseph B. Stephens and Robert L. Dreshfield *In* AGARD Mater. Substitution and Recycling Apr. 1984 15 p refs (For primary document see N84-33465 23-23)
Copyright. Avail: NTIS HC A13/MF A01

N84-33472# Wiggin Alloys Ltd., Hereford (England).
OXIDE DISPERSION STRENGTHENED ALLOYS
G. A. J. Hack *In* AGARD Mater. Substitution and Recycling Apr. 1984 16 p refs (For primary document see N84-33465 23-23)
Copyright. Avail: NTIS HC A13/MF A01

N84-33473# Vanderbilt Univ., Nashville, Tenn. Dept. of Metallurgy and Management of Technology.
SUBSTITUTION AND CONSERVATION TECHNOLOGY FOR CHROMIUM
Allen G. Gray *In* AGARD Mater. Substitution and Recycling Apr. 1984 11 p (For primary document see N84-33465 23-23)
Copyright. Avail: NTIS HC A13/MF A01

N84-33474# National Physical Lab., Teddington (England).
POTENTIAL OF METAL-MATRIX COMPOSITES AS SUPERALLOY SUBSTITUTES
M. McLean and T. Khan (ONERA) *In* AGARD Mater. Substitution and Recycling Apr. 1984 10 p refs (For primary document see N84-33465 23-23)
Copyright. Avail: NTIS HC A13/MF A01

N84-33477# Atomic Energy Research Establishment, Harwell (England). Materials Development Div.
COATINGS FOR FUEL ECONOMY OR MATERIALS SUBSTITUTION
J. P. Coad and K. T. Scott *In* AGARD Mater. Substitution and Recycling Apr. 1984 11 p refs (For primary document see N84-33465 23-23)
Copyright. Avail: NTIS HC A13/MF A01

N84-33482# Societe Nationale d'Etude et de Construction de Moteurs d'Aviation, Paris (France).
PROBLEMS PRESENTED TO ENGINE BUILDERS BY THE RECYCLING OF METALLIC MATERIALS [PROBLEMES POSES AUX MOTORISTES PAR LE RECYCLAGE DES MATERIAUX METALLIQUES]
Y. Honnorat and J. Nouailles *In* AGARD Mater. Substitution and Recycling Apr. 1984 7 p refs In FRENCH (For primary document see N84-33465 23-23)
Copyright. Avail: NTIS HC A13/MF A01

N84-33484# National Physical Lab., Teddington (England). Div. of Materials Applications
TRACE ELEMENTS IN SUPERALLOYS AND THE IMPLICATIONS FOR RECYCLING
P. N. Quested, T. B. Gibbons, and G. L. R. Durber (Glossop Superalloys Ltd.) *In* AGARD Mater. Substitution and Recycling Apr. 1984 17 p refs (For primary document see N84-33465 23-23)
Copyright. Avail: NTIS HC A13/MF A01

N84-33485# Ecole des Mines, Paris (France). Centre des Materiaux.
THE EFFECT OF RECYCLING ON CAST STRUCTURES AND THE INTERNAL CHARACTER OF IN100 ALLOY: A LABORATORY STUDY [EFFET DU RECYCLAGE SUR LES STRUCTURES DE FONDERIE ET LA SANTE INTERNE DE L'ALLIAGE IN 100: ETUDE DE LABORATOIRE]
Sylvie Rupp, Jean Massol, Yves Bienvenuu, and Gerard Lesoult (Ecole des Mines, Nancy) *In* AGARD Mater. Substitution and Recycling Apr. 1984 14 p refs In FRENCH (For primary document see N84-33465 23-23)
Copyright. Avail: NTIS HC A13/MF A01

N84-33487# National Aeronautical Establishment, Ottawa (Ontario). Structure and Materials Lab.
TRACE ELEMENTS AND RESIDUAL ELEMENTS IN SUPERALLOYS
Richard T. Holt *In* AGARD Mater. Substitution and Recycling Apr. 1984 14 p refs (For primary document see N84-33465 23-23)
Copyright. Avail: NTIS HC A13/MF A01

N84-33491# Joint Publications Research Service, Arlington, Va.
MHD TECHNOLOGY IN ALUMINUM CASTING Abstract Only
I. Kalinichenko *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-006) 20 Aug. 1984 p 2 Transl. into ENGLISH from Pravda (Moscow), 6 Jun. 1984 p 2 (For primary document see N84-33489 23-23)
Avail: NTIS HC A04/MF A01

N84-33492# Joint Publications Research Service, Arlington, Va.
STUDY OF SIZE FACTOR EFFECT ON LOW-CYCLE FATIGUE OF ALUMINUM ALLOYS Abstract Only
A. L. Kaplinskiy *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-006) 20 Aug. 1984 p 3 Transl. into ENGLISH from Probl. Prochnosti (Kiev), no. 5, May 1984 p 18-20 (For primary document see N84-33489 23-23)
Avail: NTIS HC A04/MF A01

N84-33493# Joint Publications Research Service, Arlington, Va.
PORTABLE ELECTROMAGNETIC FLAW DETECTOR FOR METAL PRODUCTS Abstract Only
K. Chavaga *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-006) 20 Aug. 1984 p 4 Transl. into ENGLISH from Sov. Kirg. SSR (Frunze), 26 Jun. 1984 p 3 (For primary document see N84-33489 23-23)
Avail: NTIS HC A04/MF A01

N84-33494# Joint Publications Research Service, Arlington, Va.
C.A.T. SCANNER FOR DETECTING FLAWS IN METALS Abstract Only
Z. Kudrya *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-006) 20 Aug. 1984 p 5 Transl. into ENGLISH from Izv. (Moscow), 7 Jul. 1984 p 1 (For primary document see N84-33489 23-23)
Avail: NTIS HC A04/MF A01

N84-33499# Joint Publications Research Service, Arlington, Va.
DEVELOPMENT OF FERROUS METALLURGY DESCRIBED Abstract Only
I. P. Kazanets *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-006) 20 Aug. 1984 p 10-14 Transl. into ENGLISH from Ekon. Gazeta (Moscow), no. 24, Jun. 1984 p 2 (For primary document see N84-33489 23-23)
Avail: NTIS HC A04/MF A01

N84-33500# Joint Publications Research Service, Arlington, Va.
MECHANICAL PROPERTIES OF COMPONENTS MADE FROM POWDERS RECEIVED BY PROCESSING LOW-GRADE POROUS TITANIUM Abstract Only
V. A. Pavlov, S. N. Kororkin, Zh. G. Volchok, V. A. Krozdenko, G. V. Avrunina, and V. M. Prozorov *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-006) 20 Aug. 1984 p 18 Transl. into ENGLISH from Tsvetn. Metal. (Moscow), no. 5, May 1984 p 92-93 (For primary document see N84-33489 23-23)
Avail: NTIS HC A04/MF A01

N84-33501# Joint Publications Research Service, Arlington, Va.
PRODUCTION OF EXTRA-PURE IRON FOR CERMET BEARINGS Abstract Only
A. Kovtun *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-006) 20 Aug. 1984 p 18 Transl. into ENGLISH from Rabochaya Gazeta (Kiev), 3 Jul. 1984 p 1 (For primary document see N84-33489 23-23)
Avail: NTIS HC A04/MF A01

N84-33502# Joint Publications Research Service, Arlington, Va.
POWDER METALLURGY R AND D ORGANIZATIONS FEATURED Abstract Only
V. Dolmatov *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-006) 20 Aug. 1984 p 19 Transl. into ENGLISH from Sov. Rossiya (Moscow), 7 Jul. 1984 p 2 (For primary document see N84-33489 23-23)
Avail: NTIS HC A04/MF A01

N84-33503# Joint Publications Research Service, Arlington, Va.
EFFECT OF STRESS CONCENTRATION ON FATIGUE RESISTANCE OF HEAT-RESISTANT NICKEL ALLOYS Abstract Only
M. S. Belyayev and N. D. Zhukov *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-006) 20 Aug. 1984 p 21 Transl. into ENGLISH from Probl. Prochnosti (Kiev), no. 5, May 1984 p 10-14 (For primary document see N84-33489 23-23)
Avail: NTIS HC A04/MF A01

N84-33504# Joint Publications Research Service, Arlington, Va.
KINETIC TIME-TEMPERATURE EQUATION FOR CREEP OF HEAT-RESISTANT ALLOYS TAKING AGING INTO ACCOUNT Abstract Only
V. N. Kiselevskiy *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-006) 20 Aug. 1984 p 21-22 Transl. into ENGLISH from Probl. Prochnosti (Kiev), no. 5, May 1984 p 7-10 (For primary document see N84-33489 23-23)
Avail: NTIS HC A04/MF A01

N84-33505# Joint Publications Research Service, Arlington, Va.
ELASTIC PROPERTIES OF TEXTURED SHEETS OF TWO-PHASE TITANIUM ALLOYS Abstract Only
I. G. Zakharchenko, V. S. Ivaniy, N. V. Ivaniy, and V. S. Kshnyakin *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-006) 20 Aug. 1984 p 24 Transl. into ENGLISH from Fiz. Metal. Metalloved. (Sverdlovsk), v. 57, no. 4, Apr. 1984 p 818-821 (For primary document see N84-33489 23-23)
Avail: NTIS HC A04/MF A01

N84-33506# Joint Publications Research Service, Arlington, Va.
TEXTURE EFFECT ON ANISOTROPY OF ELECTRIC AND MAGNETIC PROPERTIES OF TITANIUM ALPHA-ALLOYS Abstract Only
N. D. Reymer, R. A. Adamescu, and V. V. Mukhayev *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-006) 20 Aug. 1984 p 24-25 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Metal. (Moscow), no. 3, May - Jun. 1984 p 122-125 (For primary document see N84-33489 23-23)
Avail: NTIS HC A04/MF A01

N84-33507# Joint Publications Research Service, Arlington, Va.
ELECTRON MICROSCOPE STUDY OF PROCESSES OF POLYGONIZATION AND RECRYSTALLIZATION IN ALPHA-PHASE OF TWO-PHASE (ALPHA + BETA)-TITANIUM ALLOYS WITH PLATE STRUCTURE Abstract Only
N. Z. Pertsovskiy, N. M. Semenova, M. Ya. Brun, and O. A. Mozolevskaya *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-006) 20 Aug. 1984 p 25 Transl. into ENGLISH from Fiz. Metal. i Metalloved. (Sverdlovsk), vol. 57, no. 4, Apr. 1984 p 737-743 (For primary document see N84-33489 23-23)
Avail: NTIS HC A04/MF A01

N84-33508# Joint Publications Research Service, Arlington, Va.
PLASTICITY OF LARGE-GRAIN TITANIUM ALLOY TYPE VT30 IN THE BETA AREA Abstract Only
O. A. Kaybyshev, R. M. Galeyev, and G. A. Salischev *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-006) 20 Aug. 1984 p 26 Transl. into ENGLISH from Fiz. Metal. i Metalloved. (Sverdlovsk), vol. 57, no. 4, Apr. 1984 p 788-794 (For primary document see N84-33489 23-23)
Avail: NTIS HC A04/MF A01

N84-33509# Joint Publications Research Service, Arlington, Va.
LOW-CYCLE FATIGUE OF VT1-0 ALLOY AND CHANGES IN ITS FINE STRUCTURE AT TEMPERATURES OF 293-4.2 DEG K Abstract Only
V. A. Strizhalo, Yu. N. Petrov, G. N. Nadezhdin, A. I. Zinchenko, V. L. Svechnikov, and N. D. Bakalinskaya *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-006) 20 Aug. 1984 p 26 Transl. into ENGLISH from Probl. Prochnosti (Kiev), no. 5, May 1984 p 14-18 (For primary document see N84-33489 23-23)
Avail: NTIS HC A04/MF A01

N84-33510# Joint Publications Research Service, Arlington, Va.
DEFORMATION AND FAILURE OF TITANIUM ALUMINIDE Abstract Only
S. M. Barinov and Z. A. Samoylenko *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-0060 20 Aug. 1984 p 27 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Metal. (Moscow), no. 3, May - Jun. 1984 p 164-168 (For primary document see N84-33489 23-23)
Avail: NTIS HC A04/MF A01

N84-33511# Joint Publications Research Service, Arlington, Va.
EFFECT OF THERMOCYCLIC PROCESSING ON PHASE COMPOSITION AND STRUCTURE OF VT22 ALLOY Abstract Only
V. N. Gridnev, O. M. Ivasishin, and V. L. Svechnikov *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-006) 20 Aug. 1984 p 27-28 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Metal. (Moscow), no. 3, May - Jun. 1984 p 136-141 (For primary document see N84-33489 23-23)
Avail: NTIS HC A04/MF A01

N84-33518# Joint Publications Research Service, Arlington, Va.
EFFECT OF SURFACE CONDITION AND EDGE PREPARATION ON METAL FUSION DURING LASER WELDING Abstract Only
V. A. Bashenko, N. V. Kulikov, and A. V. Surkov *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-006) 20 Aug. 1984 p 32 Transl. into ENGLISH from Svarochnoye Proizv. (Moscow), no. 5, May 1984 p 16-18 (For primary document see N84-33489 23-23)
Avail: NTIS HC A04/MF A01

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N84-33586 Polish Academy of Sciences, Warsaw. Inst. Podstawowych Problemow Techniki.
[REVIEW OF THE STRENGTH OF BRITTLE ROCK MATERIALS]
Malgorzata Wolna and Marek Sklodowski 1983 36 p refs In POLISH
Copyright. Avail: Issuing Activity

The deformation and fracture of polymers are described. Theories underlying the cracking of solids are reviewed. A method for measuring the strength of brittle materials is elaborated using gypsum for the purpose of illustration. For individual titles, see N84-33587 through N84-33588.

N84-33587# Polish Academy of Sciences, Warsaw. Inst. Podstawowych Problemov Techniki.
SOME ASPECTS OF THE DEFORMATION AND BRITTLE DESTRUCTION OF ELASTOOPTIC MATERIALS [NIEKTORE ASPEKTY ODKSZTALCENIA I KRUCHEGO ZNISZCZENIA MATERIALOW ELASTOOPTYCZNYCH]
Malgorzata Wolna *In its* Rev. of the Strength of Brittle Rock Mater. 1983 28 p refs In POLISH (For primary document see N84-33586 23-27)
Copyright. Avail: Issuing Activity

The current state of knowledge concerning the deformation and fracture of polymers, the basic elasto-optics building material, is described. Brittle and nonbrittle polymer deformation are discussed, and polymer resistance is illustrated in mathematical formulas. Theories underlying the cracking of solids are reviewed. The suitability of brittle materials to the elasto-optic method is dependent on their fulfilling certain conditions, among which are the appropriate degree of optical sensitivity and linear dependence between stresses, deformations, and the elasto-optic effect. The use of brittle elasto-optic materials in model deformation studies is reviewed. Transl. by B.G.

N84-33588# Polish Academy of Sciences, Warsaw. Inst. Podstawowych Problemov Techniki.
STRENGTH OF GYPSUM IN COMPLEX STATES OF STRESS [WYYRZYMALOSC GIPSU W ZLOZONYCH STANACH NAPREZENIA]
Sklodowski Marek *In its* Rev. of the strenght of Brittle Rock Mater. 1983 5 p refs In POLISH (For primary document see N84-33586 23-27)
Copyright. Avail: Issuing Activity

A new method for measuring the strength of brittle materials is elaborated. Gypsum samples are used for purposes of illustration. The method further develops the method for producing uniform plane-stress states with application to fiber reinforced materials. The special configuration of the new method allows for a uniform distribution of stresses along the measured section. In particular, the resistance of gypsum is measurable with uniform two axial tension. With the use of the new method, gypsum strength was evaluated at five states of stress. The consistency of the results with findings in the literature is discussed. Transl. by B.G.

N84-33589* National Aeronautics and Space Administration. Pasadena Office, Calif.
GLASS HEATING PANELS AND METHOD FOR PREPARING THE SAME FROM ARCHITECTURAL REFLECTIVE GLASS Patent
Paul J. Shlichta (JPL, California Inst. of Tech., Pasadena) and Bruce A. Nerad, inventors (to NASA) (JPL, California Inst. of Tech., Pasadena) Issued 10 Jul. 1984 11 p Filed 26 Jan. 1982 Supersedes N82-23396 (20 - 14, p 1927) Sponsored by NASA (NASA-Case-NPO-15753-1; NAS 1.71:NPO-15753-1; US-Patent-4,459,470; US-Patent-Appl-SN-342871; US-Patent-Class-219-522; US-Patent-Class-219-203; US-Patent-Class-219-543; US-Patent-Class-219-541; US-Patent-Class-219-219; US-Patent-Class-338-309; US-Patent-Class-428-432) Avail: US Patent and Trademark Office CSCL 11B

Electrodes are positioned in intimate contact with an outer surface of a thin electrically insulating protecting layer of architectural reflective glass. Application of a voltage of sufficient magnitude substantially destroys the insulating layer located beneath the electrodes. A subsequent application of voltage results in a passage of current through the underlying thin, light reflective metal or metal oxide layer and in concomitant output of heat. NASA

N84-33590*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FRICTION BEHAVIOR OF SILICON IN CONTACT WITH TITANIUM, NICKEL, SILVER AND COPPER
Hiroshi Mishina (Institute of Physical and Chemical Research) and Donald H. Buckley Sep. 1984 8 p refs
(NASA-TP-2362; E-2036; NAS 1.60:2362) Avail: NTIS HC A02/MF A01 CSCL 11G

Sliding friction experiments are conducted with the semiconductor silicon in contact with the metals titanium, nickel, copper, and silver. Sliding is on the (111) plane of single-crystal silicon in the [112] crystallographic direction both in dry and lubricated (mineral oil) sliding. The friction coefficient in dry sliding is controlled by adhesion and the surface chemical activity of the metal. The more active the metal the stronger the adhesion and the higher the friction. In lubricated sliding the lubricant absorbs to the surfaces and reduces the importance of metal chemical effects. In lubricated sliding, silicon ceases to behave in a brittle manner and undergoes plastic deformation under load. M.A.C.

N84-33591*# Thompson (H. I.) Fiber Glass Co., Compton, Calif. Woven Structures.
DOUBLE LAYERED TAILORABLE ADVANCED BLANKET INSULATION
David Falstrup May 1983 31 p
(Contract NAS2-11351)
(NASA-CR-166600; NAS 1.26:166600) Avail: NTIS HC A03/MF A01 CSCL 11E

An advanced flexible reusable surface insulation material for future space shuttle flights was investigated. A conventional fly shuttle loom with special modifications to weave an integral double layer triangular core fabric from quartz yarn was used. Two types of insulating material were inserted into the cells of the fabric, and a procedure to accomplish this was developed. The program is follow up of a program in which single layer rectangular cell core fabrics are woven and a single type of insulating material was inserted into the cells. E.A.K.

N84-33592*# Hughes Aircraft Co., El Segundo, Calif.
ADVANCED STRAIN-ISOLATION-PAD MATERIAL WITH BONDED FIBROUS CONSTRUCTION
R. W. Seibold, C. A. Saito, and B. W. Buller Moffett Field, Calif. NASA. Ames Research Center Sep. 1982 74 p refs
(Contract NAS2-11059)
(NASA-CR-166599; NAS 1.26:166599) Avail: NTIS HC A04/MF A01 CSCL 11E

The feasibility of utilizing air lay and liquid lay felt deposition techniques to fabricate strain isolation pad (SIP) materials for the Space Shuttle Orbiter was demonstrated. These materials were developed as candidate replacements for the present needled felt SIP used between the ceramic tiles and the aluminum skin on the undersurface of the Orbiter. The SIP materials that were developed consisted of high temperature aramid fibers deposited by controlled fluid (air or liquid) carriers to form low density unbonded felts. The deposited felts were then bonded at the fiber intersections with a small amount of high temperature polyimide resin. This type of bonded felt construction can potentially eliminate two of the problems associated with the present SIP, viz., transmittal of localized stresses into the tiles and load history dependent mechanical response. However, further work is needed to achieve adequate through thickness tensile strength in the bonded felts. Author

N84-33593*# National Aeronautics and Space Administration, Washington, D. C.
EFFECTS OF APPLIED PRESSURE ON HOT-PRESSING OF BETA-SIC
Makoto Kinoshita, Hiroyuki Matsumura, Mikio Iwasa, and Ryozo Hayami Feb. 1984 20 p refs Transl. into ENGLISH from Yokyo Kyokai-Shi (Japan), v. 89, no. 6, 1981 p 302-309 Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep by Government Industrial Research Inst., Osaka, Japan
(Contract NASw-3541)
(NASA-TM-77397; NAS 1.15:77397) Avail: NTIS HC A02/MF A01 CSCL 11G

The effects of applied pressure on the densification during hot pressing of beta-SiC compacts were investigated. Beta-SiC powder is Starck made and has the average particle size of about 0.7 micrometer. Hot pressing experiments were carried out in graphite dies at temperatures of 1700 deg to 2300 deg C and at the pressures up to 1000 kg/sq cm. The compacts containing 1 weight percent B4C were examined. Sintered compacts were examined for microstructure and the Rockwell A-scale hardness was measured. The B4C addition was very effective to mitigate the hot pressing conditions. It is found that densification goes with the strengthening of the bonding and does not occur in particle deformation due to concentrated stress. E.A.K.

N84-33594*# National Aeronautics and Space Administration, Washington, D. C.
OXIDATION CHARACTERISTICS OF MOLYBDENUM-ZIRCONIUM OXIDE CERMETS
B. Heitzinger May 1984 16 p refs Transl. into ENGLISH of conf. paper "Oxidationsverhalten von Mo + ZrO2-Cermets" presented at the 7th Plansee Seminar, 1971 p 1-15 Seminar held at Reutte, Austria, 21-25 Jul. 1971 Original language document was announced as A72-26865 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-77622; NAS 1.15:77622) Avail: NTIS HC A02/MF A01 CSCL 11G

The oxidation of molybdenum is affected by the factors of temperature, the oxygen pressure in the oxidizing atmosphere,

and the time of exposure. Studies of the oxidation characteristics of Mo show that the oxidation rate increases strongly when the temperature exceeds 600 C. Investigations of the behavior of cermets with various percentages of zirconium oxide are discussed, taking into account oxidation conditions at temperatures under and above the melting point of molybdenum trioxide.
E.R. (IAA)

N84-33595*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
IMPROVED THERMAL BARRIER COATING SYSTEM Patent Application
Stephan Stecura, inventor (to NASA) Filed 14 Aug. 1984 8 p
(NASA-Case-LEW-14057-1; NAS 1.71:LEW-14057-1;
US-Patent-Appl-SN-640712) Avail: NTIS HC A02/MF A01 CSCL 11G

An oxide thermal barrier coating is described which comprises ZrO3 - Yb2O3 that is plasma sprayed onto a previously applied bond coating. The zirconia is partially stabilized with about 12.4 v/o ytterbia to insure cubic, monoclinic, and tetragonal phases. NASA

N84-33596*# Kentron International, Inc., Hampton, Va.
A THEORETICAL STUDY OF RESIN FLOWS FOR THERMOSETTING MATERIALS DURING PREPREG PROCESSING Final Report
T. H. Hou Jul. 1984 34 p refs
(Contract NAS1-16000)
(NASA-CR-172442; NAS 1.26:172442) Avail: NTIS HC A03/MF A01 CSCL 11B

A flow model which describes the process of resin consolidation during prepreg lamination was developed. The salient features of model predictions were explored. It is assumed that resin flows in all directions originate from squeezing action between two approaching adjacent fiber/fabric layers. In the horizontal direction, a squeezing flow between two nonporous parallel plates is analyzed, while in the vertical direction a poiseuille type pressure flow through porous media is assumed. Proper force and mass balance was established for the whole system which is composed of these two types of flow. A flow parameter, CF, shows to be a measure of processibility for the curing resin. For a given external load-F the responses of resin flow during prepreg lamination, as measured by CF, are categorized into three regions: (1) the low CF region where resin flows are inhibited by the high chemoviscosity during initial curing stages; (2) the median CF region where resin flows are properly controllable; and (3) the high CF region where resin flows are ceased due to fiber/fabric compression effects. Resin losses in both directions are calculated. Potential uses of this model and quality control of incoming prepreg material are discussed.
E.A.K.

N84-33597# Ultramet, Pacoima, Calif.
HIGH TEMPERATURE OXIDATION RESISTANT COATINGS Final Report, Oct. 1983 - Apr. 1984
R. H. Tuffias, J. T. Harding, and R. B. Kaplan Edwards AFB, Calif. Air Force Rocket Propulsion Lab. Jun. 1984 22 p
(Contract F04611-83-C-0056)
(AD-A143633; AFRPL-TR-84-036) Avail: NTIS HC A02/MF A01 CSCL 11/3

The feasibility of chemically vapor depositing hafnium oxide and zirconium oxide onto rhenium substrates as potential oxidation resistant materials was investigated. Deposition of the oxide directly is not feasible on materials which oxidize rapidly since direct deposition requires subjecting these materials to an oxidizing environment prior to deposition. Deposition of the oxide was accomplished by first depositing the metal carbide and then oxidizing it. Hard, dense continuous coatings of hafnium carbide which showed good bond strength were achieved. Post coating heat treatment results in a good metallurgical bond between the carbide and the substrate. It has been demonstrated that hafnium carbide/oxide is orders-of-magnitude more oxidation resistant that rhenium or tungsten.
Author (GRA)

N84-33598# Aerospace Corp., El Segundo, Calif. Chemistry and Physics Lab.
TRICRESYL PHOSPHATE RETENTION BY BEARING RETAINER AND RESERVOIR MATERIALS
D. J. Carre, R. Bauer, and P. D. Fleischauer 16 Jul. 1984 18 p
(Contract F04701-83-C-0084)
(AD-A143842; TR-0084(4945-03)-4; SD-TR-84-22) Avail: NTIS HC A02/MF A01 CSCL 13/9

Tricresyl phosphate (TCP) is an important extreme-pressure additive in lubricating oils. Its depletion from reservoir oil could constitute a failure mechanism for bearing systems. The interaction of TCP with bearing retainer and reservoir materials was investigated using an apparatus that mimicked centrifugal oil feed. TCP was not selectively absorbed by cotton-phenolic retainer or wool felt reservoir materials, but was absorbed by nitrile-acrylic and sintered nylon reservoir materials, which exhibited significant TCP retention. The results are discussed in terms of the degree of bulk oil absorption, the availability of polar sites on the sorbents, and the interaction between such sites and the TCP molecules.
Author (GRA)

N84-33599# Cincinnati Univ., Ohio. Dept. of Materials Science and Metallurgical Engineering.
STRUCTURE AND PROPERTIES OF POLYMERS AND ORGANOSILANES ABSORBED ONTO OXIDIZED ALUMINUM AND TITANIUM Annual Report, 1 Jul. 1983 - 30 Jun. 1984
F. J. Boerio 15 Jul. 1984 43 p
(Contract N00014-80-C-0733)
(AD-A143935; AR-4) Avail: NTIS HC A03/MF A01 CSCL 11/1

X-ray photoelectron spectroscopy (XPS) was used to determine the locus of failure in iron/epoxy lap joints that had been immersed in water at 60 deg C for long times and then tested to determine their retained strength. The fracture surfaces of joints prepared from adherends pretreated with aqueous solutions of gamma-aminopropyltriethoxysilane (gamma-APS) at pH 8.0 contained significant amounts of silicon but very little iron, indicating that failure was probably near the adhesive/silane interface. GRA

N84-33600# Massachusetts Univ., Amherst. Dept. of Polymer Science and Engineering.
THERMAL DEGRADATION STUDIES OF SEGMENTED THERMOPLASTIC ELASTOMERS
J. C. W. Chien and J. L. Fan 1 Jul. 1984 35 p
(Contract N00014-83-K-0083; NR Proj. 659-795)
(AD-A143954; TR-2) Avail: NTIS HC A03/MF A01 CSCL 11/9

Flash pyrolysis of segmented thermoplastic elastomers has been performed. The produces were GC separated and MS identified. Most of the products of the soft segments were accounted for by random scission of one backbone bond to give macroradicals which eliminate various compounds via intramolecular shifts of hydrogens or methyl groups and ring closure. Certain products were better rationized by direct intramolecular rearrangements. In the case of polyetherpolyurethane chain extended with BI, it is shown that the hard segment decomposes before the soft segment in agreement with earlier TGA results. This study showed that pyrolysis-GC-MS can be used either to elucidate the mechanism of thermal decomposition of segmented block copolymers or to determine the structures of related unknown copolymers. Only in the case of the polyimide hard segment were we unable to detect its pyrolysate.
Author (GRA)

N84-33601# Massachusetts Inst. of Tech., Cambridge. Dept. of Chemical Engineering.
COMPATIBILIZING EFFECT OF A DIBLOCK COPOLYMER OF ISOTACTIC POLYSTYRENE AND ISOTACTIC POLYPROPYLENE IN BLENDS OF THE CORRESPONDING HOMOPOLYMERS
R. E. Cohen, L. DelGiudice, G. Attalla, and F. Bertinotti 10 Aug. 1984 29 p
(Contract N00014-77-C-0311)
(AD-A143959; TR-12) Avail: NTIS HC A03/MF A01 CSCL 07/3

A high molecular weight polymer mixture was obtained from a

sequential Ziegler-Natta polymerization of styrene and propylene. After removing unwanted homopolymers from the reaction product, the remaining copolymer was subjected to extensive molecular and morphological characterization. The results of these experiments indicate that the purified material is a diblock copolymer of isotactic polystyrene and isotactic polypropylene, with each block having a molecular weight in the range of 225,000 g/mole. This block copolymer was incorporated in varying amounts into blends of isotactic polystyrene and isotactic polypropylene homopolymers. At low concentrations of copolymer, the diblock functions as a dispersing agent, significantly reducing the size of domains in the heterogeneous blends. At higher copolymer concentrations, a dramatic improvement in the adhesion across the domain boundaries is also observed. The favorable effects of the copolymer on mechanical properties are demonstrated in the results of tensile impact experiments. GRA

N84-33602# Naval Postgraduate School, Monterey, Calif.
AN EVALUATION OF POLYMER COATINGS FOR THE PROMOTION OF DROPWISE CONDENSATION OF STEAM M.S. Thesis
Kenneth M. Holden, II Mar. 1984 109 p
(AD-A144018; AD-E751074; NPS-69-84-003; NSF/MEA-82-03567) Avail: NTIS HC A06/MF A01 CSCL 13/1

Fifteen polymer coatings were evaluated for their ability to promote and sustain dropwise condensation of steam to enhance the heat transfer capability of steam condensers. Of the fifteen coatings, nine employed a fluoropolymer as a major constituent. Of the other six, four were hydrocarbons, one a chlorocarbon and one a silicone. Each coating was applied to four different metal substrates: brass, copper, naval brass, and titanium. While exposed to steam at atmospheric pressure, each coating was visually evaluated for its ability to promote dropwise condensation. Observations were conducted over a period of 4000 hours. Hardness and adhesion tests were performed on selected specimens both before and after exposure. GRA

N84-33603# Mound Lab., Miamisburg, Ohio.
CHARACTERIZATION OF POLYETHERETHERKETONE AND OTHER ENGINEERING THERMOPLASTICS
Ruth B. Whitaker, Allan B. Nease, and Richard O. Yelton 13 Apr. 1984 27 p refs
(Contract DE-AC04-76DP-00053)
(DE84-010668; MLM-3141) Avail: NTIS HC A03/MF A01

Thermal/spectroscopic means to assess the suitability of polyetheretherketone (PEEK), polyetherimide (PEI) and polyethersulfone (PES) in fiberglass filled molding resins. Thermogravimetric analysis of these thermoplastics in N2 shows that all have a decomposition onset temperature greater than or equal to 525 C with PEEK > PEI > PES. Melt thermal stability analyses of glass-filled PEEK and of PEI show < 1% weight loss after 2 hr (N2). Thermomechanical analysis (TMA) of glass-filled PEEK revealed a low temperature (approx. 60 C to 70 C) transition below T/sub g/ (approx. 150 C). This transition disappeared on subsequent TMA runs and did not reappear on aging at room temperature, which suggests it was the result of molding stresses. Extra transitions below T/sub g/ were also noted for PES and PEI. Direct probe/mass spectroscopy reconstructed ion chromatograms showed water and phenyl sulfone ions to be present in both PES and PEEK (and volatilized below 200 C in vacuum). Water only was observed in PEI. The presence of phenyl sulfone in PEEK was confirmed by FT-IR, and sulfur was found in amounts up to 0.23% by weight in 30% glass-filled molding compounds. Fluoride was also detected. DOE

N84-33604# Sandia Labs., Albuquerque, N. Mex.
PVC (POLYVINYLCHLORIDE) PIPE RELIABILITY AND FAILURE MODES
Margaret M. Carroll Jun. 1984 11 p refs
(Contract DE-AC04-76DP-00789)
(DE84-013862; SAND-83-2464) Avail: NTIS HC A02/MF A01

Tests were conducted to determine failure modes and consequences in polyvinyl chloride (PVC) pipes. PVC pipe is essentially brittle in nature, and it is relatively easily damaged by mechanical means such as being struck by tools or other materials; being weakened or fractured by gouging, abrasion or rough handling such as commonly occurs when pipe sections are thrown or walked on by workers. Excessive heat, welding slag, sunlight, and certain chemicals adversely affect it. There is also some concern about manufacturing processes which can affect product quality and integrity. DOE

N84-33605# Department of Energy, Washington, D. C.
HIGH TEMPERATURE ADHESIVE SILICONE FOAM COMPOSITION, FOAM GENERATING SYSTEM AND METHOD OF GENERATING FOAM Patent Application
Judith W. Mead, Orelio J. Montoya, Peter B. Rand, and Vernon O. Willan, inventor (to DOE) Filed 21 Dec. 1983 16 p
(Contract DE-AC04-76DP-00789)
(DE84-014315; US-Patent-Appl-SN-564103) Avail: NTIS HC A02/MF A01

Access to a space which is impeded by generation of a sticky foam from a silicone polymer and a low boiling solvent such as a halogenated hydrocarbon is discussed. The formulation is polydimethylsiloxane gel mixed with F502 Freon as a solvent and blowing agent, and pressurized with CO2 in a vessel to about 250 PSI, whereby when the vessel is opened, a sticky and solvent resistant foam is deployed. The foam is deployable, over a wide range of temperatures, adhering to wet surfaces as well as dry, is stable over long periods of time and does not propagate flame or lose adhesive properties during an externally supported burn. DOE

N84-33606# Department of Energy, Washington, D. C.
FABRICATION OF METALLIC GLASS STRUCTURES Patent Application
Carl F. Cline, inventor (to DOE) Filed 20 Oct. 1983 13 p
(Contract W-7405-eng-48)
(DE84-014499; US-Patent-Appl-SN-543686) Avail: NTIS HC A02/MF A01

Amorphous metal powders or ribbons are fabricated into solid shapes of appreciable thickness by the application of compaction energy. The temperature regime wherein the amorphous metal deforms by viscous flow is measured. The metal powders or ribbons are compacted within the temperature regime. DOE

N84-33607# Department of Energy, Washington, D. C.
SOLUBLE POLYACETYLENIC AND POLYAROMATIC POLYMERS AND METHOD OF MAKING THE SAME Patent Application
Mahmoud Aldissi and Raimond Liepins, inventors (to DOE) Filed 16 Dec. 1983 13 p
(Contract W-7405-eng-36)
(DE84-014314; US-Patent-Appl-SN-562243) Avail: NTIS HC A02/MF A01

A method of making a soluble polyene polymer are disclosed. The polymer is suitable for doping to produce an electrically conductive polymer. The method is generally applicable to acetylenic and aromatic monomers, proven examples of which include acetylene, benzene, anthracene and naphthalene. The monomer is dissolved in arsenic trifluoride. Arsenic pentafluoride is then introduced into the solution to induce polymerization by what is speculated to be an ionic polymerization reaction. The resulting polymer differs from other polyene polymers in that it is soluble in common organic solvents, and it can be melted without undergoing decomposition, making it particularly suitable for processing in to various polymeric articles. DOE

N84-33479# Army Materials and Mechanics Research Center, Watertown, Mass.
CERAMICS AS SUBSTITUTES FOR SCARCE METALS
R. Nathan Katz *In* AGARD Mater. Substitution and Recycling Apr. 1984 8 p refs (For primary document see N84-33465 23-23) Avail: NTIS HC A13/MF A01

N84-33483# Pratt and Whitney Aircraft Group, West Palm Beach, Fla. Government Products Div.

COATING DEVELOPMENTS TO RESTRICT STRATEGIC MATERIALS USAGE
R. J. Hecht and D. S. Halfpap *In* AGARD Mater. Substitution and Recycling Apr. 1984 7 p (For primary document see N84-33465 23-23)
Copyright. Avail: NTIS HC A13/MF A01

N84-33495# Joint Publications Research Service, Arlington, Va.
CORROSION RESISTANT GLASS COATING FOR METALS Abstract Only
G. Namtalashvili *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-006) 20 Aug. 1984 p 6 Transl. into ENGLISH from Sots. Industr. (Moscow), 23 May 1984 p 2 (For primary document see N84-33489 23-23)
Avail: NTIS HC A04/MF A01

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers; storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N84-33608*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FTIR ANALYSIS OF AVIATION FUEL DEPOSITS
Larry S. Helmick and Gary T. Seng Sep. 1984 31 p refs
(NASA-TM-83773; E-2200; NAS 1.15:83773) Avail: NTIS HC A03/MF A01 CSCL 07D

Five modes of operation of the Nicolet 7199 Fourier Transform Infrared Spectrophotometer have been evaluated for application in analysis of the chemical structure of accelerated storage/thermal deposits produced by jet fuels. Using primarily the absorption and emission modes, the effects of fuel type, stress temperature, stress time, type of spiking agent, spiking agent concentration, fuel flow, and post-depositional treatment on the chemical nature of fuel deposits have been determined. Author

N84-33609# Materials Research Labs., Ascot Vale (Australia).
DETONATION PARAMETERS FOR AUSTRALIAN HIGH-EXPLOSIVES COMPOSITION
G. J. Jenks, J. J. Masinskas, and D. A. Price (Melbourne Univ., Australia) May 1983 27 p
(AD-A143655; MRL-R-882) Avail: NTIS HC A03/MF A01 CSCL 19/1

The implementation of the BKW computer code on the CSIRO Cyber 76 computer network is described. A user interface is developed so that difficulties in transferring the program to another computer are minimized and so that results can be obtained reliably and quickly from data already stored in the network. Author (GRA)

N84-33610# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ACTA ARMAMENTARII (SELECTED ARTICLES)
W. Yuanyou, Z. Bohua, C. Hongzhang, and J. Qingying 17 Jul. 1984 58 p Transl. into ENGLISH from Binggong Xuebao (China), no. 3, Aug. 1983 p 20-33, 45-59
(AD-A143904; FTD-ID(RS)T-0611-84) Avail: NTIS HC A04/MF A01 CSCL 21/9

The first article presented offers a method of calculating the pressure on the inner surface of solid rocket propellant grains. The method proposed does not use approximate inversions, and is therefore more accurate. The final results of suddenly applied pressure and gradually applied pressure are presented. The second article is a study of low frequency instability of a solid propellant rocket engine. The mutual relationship between the tubular grain design parameters and their effect on low frequency instability is noted. A relational formula is derived for analyzing low frequency instability of the tubular grain engine. The last article is a study of the ignition and initial pressure peak of small solid propellant rocket engines. The ignition and pressure peaks form at high temperatures, and a specific method for predicting the ignition pressure peak and specific measures for reducing the initial pressure peak at high temperatures are discussed. S.B.

N84-33611# Research Inst. of National Defence, Umea (Sweden). Dept. 4
METHOD FOR EVALUATION OF PETROLEUM PRODUCTS CORROSIVITY USING PIEZOELECTRIC CRYSTALS, PART 1
Roger Roffey, Hans Nilsson, and Goeran Olofsson Apr. 1984 37 p refs In SWEDISH; ENGLISH summary Sponsored by Swedish National Board of Economic Defence
(FOA-C-40189-B4-Pt-1; ISSN-0347-2124) Avail: NTIS HC A03/MF A01; Research Institute of National Defence, Stockholm KR 50

A method using piezoelectric crystals covered with silver was developed for testing the corrosivity of jet fuel. If piezoelectric crystals are exposed to corrosive compounds (e.g., sulfur compounds) which react with silver, the change in oscillations is proportional to the mass difference. The method is complementary to and more sensitive than the standard method for silver corrosivity (IP standards 227/73). Author (ESA)

N84-33490# Joint Publications Research Service, Arlington, Va.
ACTIVATED ALUMINUM ALLOY FOR GENERATING HYDROGEN FUEL Abstract Only
V. Ryndin *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-0060) 20 Aug. 1984 p 1 Transl. into ENGLISH from Kazakhstansk. Pravda (USSR), 25 May 1984 p 4 (For primary document see N84-33489 23-23)
Avail: NTIS HC A04/MF A01

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N84-33612 Polish Academy of Sciences, Warsaw.
STUDY OF THE PROCESS OF DESTRUCTION OF FIBROCONCRETE SLABS UNDER A STATIC LOAD SIMULATING THE ACTION OF A MOTOR VEHICLE'S WHEEL ON A BRIDGE [RADANIE PROCESU NISZCZENIA PLYT FIBROBETONOWYCH POD OBCIAZENIEM STATYCZNYM SYMULUJACYM DZIALANIE KOLA POJAZDU NA POMOST]
Renata Bojanowska 1982 32 p refs In POLISH
(ISSN-0208-5658) Copyright. Avail: Issuing Activity

As part of a study of the feasibility of using fibroconcrete in bridge construction, the process of destruction of quadratic fibroconcrete slabs supported freely around their circumference and reinforced with scattered steel fibers was investigated. The static load was distributed to simulate the effect of a vehicle's wheel on a bridge. Fibroconcrete was shown to be capable of withstanding significant loads and is recommended for use in bridge construction. The bases for its suitability are formulated mathematically. Author

N84-33613*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ENGINEERING AND DESIGN PROPERTIES OF THALLIUM-DOPED SODIUM IODIDE AND SELECTED PROPERTIES OF SODIUM-DOPED CESIUM IODIDE
K. Forrest, C. Haehner, T. Heslin, M. Magida, J. Uber, S. Freiman (NBS), G. Hicho (NBS), and R. Polvani (NBS) Sep. 1984 74 p refs
(NASA-RP-1131; NAS 1.61:1131; Rept-84F0257) Avail: NTIS HC A04/MF A01 CSCL 20K

Mechanical and thermal properties, not available in the literature but necessary to structural design, using thallium doped sodium iodide and sodium doped cesium iodide were determined to be coefficient of linear thermal expansion, thermal conductivity, thermal shock resistance, heat capacity, elastic constants, ultimate strengths, creep, hardness, susceptibility to subcritical crack growth, and ingot variation of strength. These properties were measured

for single and polycrystalline materials at room temperature.
Author

N84-33614# Department of Energy, Washington, D. C. Office of Basic Energy Sciences.
SUMMARIES OF FY 1983 ENGINEERING RESEARCH
Dec. 1983 84 p
(DOE/ER-0158/1) Avail: NTIS HC A05/MF A01

An overview of DOE's basic energy sciences (BES) is presented and research activities are summarized. Emphasis is on investigation of: (1) Mechanical Sciences including tribology, heat transfer, and solid mechanics. (2) System Sciences including process control and instrumentation. (3) Engineering Analysis including non-linear dynamics, data bases for thermophysical properties of fluids, and modeling of combustion processes for engineering application. A summary sheet for each study also shows the research personnel, the amount of the grant, and the research laboratory or institution. Titles of the various investigations are listed by budget number. An alphabetical index to researchers is included. S.B.

N84-33615# Department of the Air Force, Washington, D.C.
SYSTEM FOR THE REMOVAL OF AIRBORNE CONTAMINANTS FROM AIRCRAFT ENVIRONMENTAL CONTROL SYSTEMS Patent Application
D. R. Barnes and R. J. Watts, inventors (to Air Force) Filed 16 May 1984 11 p
(AD-D011172; US-Patent-Appl-SN-610897) Avail: NTIS HC A02/MF A01 CSCL 06/11

The system comprises a high pressure moisture remover, a conduit interconnecting the moisture remover with the compressor of the turbine engine of the aircraft which provides a source of pressurized air, a high pressure diffuser connected to the outlet of the moisture remover to diffuse the dried pressurized air stream to lower pressure, and an electrostatic precipitator downstream of the diffuser for removing particulate contaminants from the air stream. Alternatively, a low pressure moisture remover may be included downstream of the diffuser. A reactor and absorber may be included in the system to supplement the processes in the removal of chemical contaminants. Vent lines and discharge ports may be connected to the system where convenient, such as to the moisture remover, precipitator and absorber, in order to discharge overboard of the aircraft the liquid effluent and particles removed from the air stream. GRA

N84-33616# Argonne National Lab., Ill.
RESEARCH ON INSTRUMENTATION, TESTING AND EVALUATION
10 Apr. 1984 183 p refs Proc. of the 2nd Symp. on Energy Eng. Sci., Argonne, Ill., 10-11 Apr. 1984
(Contract W-31-109-eng-38)
(DE84-014859; CONF-8404123) Avail: NTIS HC A09/MF A01

Research in instrumentation, testing, and evaluation were discussed. Some of the topics presented include: choking in two phase flow, moderate temperature vapor liquid equilibrium measurements of CO2, semi-automatic measurement of density, pvt and vle of energy related fluids, thermal nonequilibrium vapor generation; thermal conductivity of nonelectrolyte liquids at high temperature and pressures; development of a high temperature, high pressure viscometer; smart sensors for combustion control; molecular beam sampling of transient combustion; condensation in multicomponent vapors; supercritical fluid chromatography; long and intermediate wavelength flow reconstruction. E.A.K.

N84-33617# Department of Energy, Washington, D. C.
SYSTEM FOR MAINTAINING THE ALIGNMENT OF MANDRELS IN FILAMENT WINDING OPERATIONS Patent Application
Samuel C. Robinson, William G. Dodge, and Roy E. Pollard, inventors (to DOE) Filed 12 Oct. 1983 12 p
(Contract DE-AC05-84OR-21400)
(DE84-014660; US-Patent-Appl-SN-541187) Avail: NTIS HC A02/MF A01

A system is described for sensing and correcting the alignment of a mandrel being wound with filamentary material with respect to the filamentary material with respect to the filamentary material winding mechanism. A positioned reference pin attached to the mandrel is positioned in a beam of collimated light emanating from a laser so as to bisect the light beam and create a shadow therebetween. A pair of photocells are positioned to receive the bisected light beam with the shadow uniformly located between the photocells when the pin is in a selected position. The mandrel is supported in the selected position for the winding of a filamentary material by a position adjustable roller mechanism which is coupled by a screw drive to a reversible motor. Changes in the pin position such as caused by winding growth are sensed by the photocells to provide the displacement of the roller mechanism in the direction necessary to return the mandrel to the selected position. DOE

N84-33618# Centre de Recherches Scientifiques et Techniques de l'Industrie des Fabrications Metalliques, Brussels (Belgium).
[ACTIVITIES IN METAL MANUFACTURING] Annual Report, 1983 [RAPPORT ANNUEL DU COMITE PERMANENT AU CONSEIL GENERAL, 1983]
20 Jun. 1984 49 p refs In FRENCH
Avail: NTIS HC A03/MF A01

Research in foundry technology, metal construction, mechanical construction, industrial automation and computerization, and transformation of plastic materials is summarized. Author (ESA)

N84-33619# Maschinenfabrik Augsburg-Nuernberg A.G., Munich (West Germany).
COMPRESSED AIR PRODUCTION WITH WASTE HEAT UTILIZATION IN INDUSTRY [DRUCKLUFTERZEUGUNG MIT ABWAERMENUTZUNG IN INDUSTRIEBETRIEBEN]
E. Nolting 1984 13 p In GERMAN Presented at Rahmen der Fachschau Energie auf der Hannover Messe 1984
Avail: NTIS HC A02/MF A01

The centralized power-heat coupling (PHC) technique using block heating power stations, is presented. Compressed air production in PHC technique with internal combustion engine drive achieves a high degree of primary energy utilization. Cost savings of 50% are reached compared to conventional production. The simultaneous utilization of compressed air and heat is especially interesting. A speed regulated drive via an internal combustion motor gives a further saving of 10% to 20% compared to intermittent operation. The high fuel utilization efficiency (> 80%) leads to a pay off after two years for operation times of 3000 hr.
Author (ESA)

N84-33620# Zeiss (Carl), Oberkochen (West Germany).
DEVELOPMENT OF PRODUCTION TECHNOLOGIES FOR THE SERIES PRODUCTION OF OPTICAL COMPONENTS WITH ASPHERIC SURFACES Final Report, Feb. 1981
Erich Heynacher Bonn Bundesministerium fuer Forschung und Technologie Jun. 1984 45 p refs In GERMAN; ENGLISH summary Sponsored by bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-115; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 9

High precision aspheric surfaces production process automation; evaluation and control function corrections in grinding machines controlled by processing computers; development of a grinding machine, polishing technique; a mold copying technique for synthetic resin; and testing techniques are described.
Author (ESA)

N84-33621# Technische Univ., Hanover (West Germany). Inst. fuer Angewandte Physik.
DEVELOPMENT OF A PRODUCTION METHOD FOR HARD DIELECTRIC COATING SYSTEMS Final Report, Nov. 1977
Johannes Ebert Bonn Bundesministerium fuer Forschung und Technologie Jun. 1984 23 p ref In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-116; ISSN-0340-7608) Avail: NTIS

HC A02/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 5

An evaporation method for dielectric layer systems was developed. Using reactive evaporation of metal oxide layers in ionized oxygen, the absorption losses of dielectric laser mirrors can be reduced for nearly one order of magnitude. Because electron guns are not required and the deposition rates are three times higher than in usual processes, the developed evaporation method is an economical production technique for a variety of dielectric layer systems such as high power coatings, low absorbing UV coatings and conductive antireflection coatings. Author (ESA)

N84-33622# Optische Werke G. Rodenstock, Munich (West Germany). Ressort Entwicklung.
SIMULATION OF THE REACTION OF OPTICAL SYSTEMS IN THE MANUFACTURING PROCESS Final Report, Dec. 1981
Fritz Blechinger, Johannes Dumanski, Hans Grumpelt, Ernst Rothe, Reinhard Schmittner, and Georg Stoecki Bonn Bundesministerium fuer Forschung und Technologie Jun. 1984 118 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-128; ISSN-0340-7608) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 25

Methods to calculate the image quality of optical systems during manufacture were developed. The calculation methods use statistical analysis. They simulate the degree of deviation in the manufacturing process from the rotational symmetry and give rapid statements concerning the anticipated spread in quality.
Author (ESA)

N84-33623# Joint Publications Research Service, Arlington, Va.
USSR REPORT: MACHINE TOOLS AND METALWORKING EQUIPMENT
6 Sep. 1984 60 p Transl. into ENGLISH from various Russian articles
(JPRS-UMM-84-016) Avail: NTIS HC A04/MF A01

This serial report contains news items, abstracts and articles of scientific reports on aspects of machine tools and metalworking equipment including robotic, industry planning, and economics. For individual titles, see N84-33624 through N84-33627.

N84-33624# Joint Publications Research Service, Arlington, Va.
VERSATILITY OF NEW EAST, WEST EUROPEAN ROBOTS VIEWED c37
In its USSR Rept.: Machine Tools and Metalworking Equipment (JPRS-UMM-84-016) 6 Sep. 1984 p 33-37 Trans. into ENGLISH from Nauki i Zhizn (Moscow), no. 11, Nov. 1983 p 58-63 (For primary document see N84-33623 23-31)
Avail: NTIS HC A04/MF A01

Soviet robots shown at the Automatizatsiya-83 exhibition, and several robot equipment complexes created on their basis are described. Robots of foreign manufacture which were exhibited were also described. B.G.

N84-33625# Joint Publications Research Service, Arlington, Va.
KIROV'S PLANT TROUBLES WITH ROBOTIZATION c37
V. Zenkovskiy *In its* USSR Rept.: Machine Tools and Metalworking Equipment (JPRS-UMM-84-016) 6 Sep. 1984 p 38-42 Transl. into ENGLISH from Sots. Industr. (Moscow), 29 Apr. 1984 p 2 (For primary document see N84-33623 23-31)
Avail: NTIS HC A04/MF A01

Failure to maintain productivity with the use of manipulators and machine tools in the Kirov plant was discussed. B.G.

N84-33626# Joint Publications Research Service, Arlington, Va.
ADMINISTRATIVE OBSTACLES TO ROBOTIZATION RECALLED c37
S. Pochin *In its* USSR Rept.: Machine Tools and Metalworking Equipment (JPRS-UMM-84-016) 6 Sep. 1984 p 43-47 Transl. ito ENGLISH from Lenigr. Pravda (Leningrad), 1 Jun. 1984 p 2 (For primary document see N84-33623 23-31)
Avail: NTIS HC A04/MF A01

The problems and difficulties in installing manipulators in industrial plants are discussed. B.G.

N84-33627# Joint Publications Research Service, Arlington, Va.
ROBOTIZATION OF STAMPING OPERATION REVIEWED c37
A. Valentinov *In its* USSR Rept.: Machine Tools and Metalworking Equipment (JPRS-UMM-84-016) 6 Sep. 1984 p 48-51 Transl. into ENGLISH from Sots. Industr. (Moscow), 29 May 1984 p 2 (For primary document see N84-33623 23-31)
Avail: NTIS HC A04/MF A01

Stamping operations are analyzed. Introduction of a robotics system is discussed. B.G.

N84-33628# Joint Publications Research Service, Arlington, Va.
EAST EUROPE REPORT: SCIENTIFIC AFFAIRS
5 Mar. 1984 47 p refs Transl. into ENGLISH from various Russian articles
(JPRS-ESA-84-007) Avail: NTIS HC A03/MF A01

The following science-related topics are addressed: microelectronics, integrated circuits, semiconductors, laser irradiation of metal parts, excimer lasers, proinsulin production through genetic engineering, particle physics, computer programming languages, radiation techniques in agriculture and the food industry, and the development of science and technology under economic reform, and telematics. A biography of the managing director of an institute of computer technology is included. For individual titles, see N84-33629 through N84-33630.

N84-33629# Joint Publications Research Service, Arlington, Va.
CEMA COOPERATION IN MICROELECTRONICS RESEARCH, PRODUCTION c33
In its East Europe Rept.: Sci. Affairs (JPRS-ESA-84-007) 5 Mar. 1984 p 1-2 Transl. into ENGLISH from Radio Fernsehen Electron. (East Berlin), no. 1, 1984 p 4 (For primary document see N84-33628 23-31)
Avail: NTIS HC A03/MF A01

The assignments resulting from an agreement concerning multilateral specialization and cooperation among European socialist countries in the development and production of microelectronic components for computer technology are enumerated. Several areas which impact directly on the manufacture of large scale and very large scale integrated components are identified.
R.S.F

N84-33630# Joint Publications Research Service, Arlington, Va.
SOVIET INTEGRATED CIRCUITS IN USE IN GDR c33
Wilfried Loeffler *In its* East Europe Rept.: Sci. Affairs (JPRS-ESA-84-007) 5 Mar. 1984 p 3-8 refs Transl. into ENGLISH from Radio Fernsehen Electron. (East Berlin), no. 11, 1983 p 690-691 (For primary document see N84-33628 23-31)
Avail: NTIS HC A03/MF A01

Transistor-transistor logic integrated circuits are enumerated along with emitter coupled logic, CMOS logic, memory circuits, and digital to analog converters. R.S.F.

N84-33475# Pratt and Whitney Aircraft Group, West Palm Beach, Fla. Government Products Div.
MANUFACTURING DEVELOPMENTS TO REDUCE STRATEGIC MATERIALS USAGE
M. M. Allen, D. S. Halfpap, and M. A. Siegel *In* AGARD Mater. Substitution and Recycling Apr. 1984 8 p (For primary document see N84-33465 23-23)
Copyright. Avail: NTIS HC A13/MF A01

N84-33478# Naval Material Command, Washington, D. C.
THE NAVY PROGRAM TO DEVELOP REPLACEMENTS FOR CRITICAL AND STRATEGIC MATERIALS
James J. Kelly and Marlin A. Kinna (Naval Sea Systems Command) *In* AGARD Mater. Substitution and Recycling Apr. 1984 10 p (For primary document see N84-33465 23-23)
Avail: NTIS HC A13/MF A01

N84-33480# Bureau of Mines, Washington, D. C. Div. of Materials and Recycling.

NEW DEVELOPMENTS IN MATERIALS RECYCLING BY THE US BUREAU OF MINES
Robert C. Horton and Charles B. Kenahan *In* AGARD Mater. Substitution and Recycling Apr. 1984 24 p refs (For primary document see N84-33465 23-23)
Copyright. Avail: NTIS HC A13/MF A01

N84-33481# Imphy S.A. (France). Etudes et Recherches.
VACUUM RECYCLING EFFECT ON MINOR ELEMENTS IN SUPERALLOYS [EFFET DES TRAITEMENTS SOUS VIDE SUR L'EVOLUTION ES TENEURS EN ELEMENTS TRACES DANS LES SUPERALLIAGES]
J. F. Wadier and J. Morlet *In* AGARD Mater. Substitution and Recycling Apr. 1984 12 p refs In FRENCH; ENGLISH summary (For primary document see N84-33465 23-23)
Copyright. Avail: NTIS HC A13/MF A01

N84-33486# Centre de Recherches Metallurgiques, Liege (Belgium). Div. Formetal.
USING RECYCLED SUPERALLOYS IN PRECISION CASTING [MISE EN OEUVRE DE SUPERALLIAGES DE REEMPLOI EN FONDERIE DE PRECISION]
M. Lambergts and J. M. Drapier *In* AGARD Mater. Substitution and Recycling Apr. 1984 12 p refs In FRENCH (For primary document see N84-33465 23-23)
Copyright. Avail: NTIS HC A13/MF A01

N84-33488# Paderborn Univ. (West Germany).
RECYCLING CONFORM DESIGN
Walter Jorden *In* AGARD Mater. Substitution and Recycling Apr. 1984 5 p refs (For primary document see N84-33465 23-23)
Copyright. Avail: NTIS HC A13/MF A01

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

N84-33631 Polish Academy of Sciences, Warsaw.
UNIFORM ASYMPTOTIC SOLUTION OF THE PROBLEM OF DIFFRACTION FOR A LINEAR QUADRUPOLE SOURCE [JEDNOLITE ROZWIAZANIE ASYMPTOTYCZNE ZAGADNIENIA DYFRAKCJI DLA LINIOWEGO ZRODLA KWADRUPOLOWEGO]
J. Zawistowski and S. Przedziecki 1983 34 p refs In POLISH (ISSN-0208-5658) Copyright. Avail: Issuing Activity

A uniform asymptotic solution for electromagnetic diffraction of a line source field by a half-plane in a uniaxially anisotropic medium is presented. The medium surrounding the half-plane is described in a system of Cartesian coordinates by means of tensors of electrical and magnetic permeability. The diffraction half-plane is fully conductive and lies perpendicular to the distinguished axis of the medium. The incident wave is beamed by the linear quadrupole source parallel to the edge of the half-plane. The basic feature of the formulated solution is its essentially vector character. Author

N84-33632 Polish Academy of Sciences, Warsaw.
WIENER-HOPF TECHNIQUE FOR THE EQUATION U(ALPHA) = K(ALPHA) L(ALPHA) + D(ALPHA) IN THE CASE OF FUNCTION K(ALPHA) WITH ZEROES [METODA WIENERA-HOPFA DLA ROWNANIA U(ALPHA) = K(ALPHA) L(ALPHA) + D(ALPHA) W PRZYPADKU FUNKCJI K(ALPHA) Z ZERAMI]
H. Kudrewicz and S. Przedziecki 1983 52 p refs In POLISH (ISSN-0208-5658) Copyright. Avail: Issuing Activity

The solution of the Wiener-Hopf equation is provided for the problem of two dimensional wave diffraction on an impedance half-plane. The solution involves solving the Helmholz equation on a plane with mixed conditions and on an infinite plane. It is demonstrated that the solution of the Wiener-Hopf equation involves factorization and four basically distinct zero line positions. Author

N84-33633 Polish Academy of Sciences, Warsaw.
ANALYSIS OF THE SOLUTION OF THE PROBLEM OF DIFFRACTION ON AN ASYMMETRIC IMPEDANCE HALF-PLANE [ANALIZA ROZWIAZANIA ZAGADNIENIA DYFRAKCJI NA ASYMETRYCZNEJ POLPLASZCYZNIE IMPEDANCYJNEJ]
H. Kudrewicz and S. Prezdziecki 1983 46 p refs In POLISH (ISSN-0208-5658) Copyright. Avail: Issuing Activity

The various solutions proposed for the problem of diffraction of a two-dimensional wave on an asymmetric impedance half-plane are reviewed. The Wiener-Hopf technique and methods based on it, including the Hilbert modification for diffraction problems, are discussed. The theoretical problem of high-frequency backscattering from an absorbing infinite strip with arbitrary face impedance is examined. Author

N84-33634 Polish Academy of Sciences, Warsaw.
ALGORITHMIZATION AND PROGRAMMING OF OPERATOR ACTIVITIES FOR PARAMETRIC SYNTHESIS OF SPEECH USING THE CT-1 SYSTEM CONTROLLED BY THE MERA 303 MINICOMPUTER [ALGORYTMIZACJA I OPROGRAMOWANIE DZIALAN OPERATORSKICH DLA PARAMETRYCZNEJ SYNTEZY MOWY ZA POMOCA UKLADU CT-1 STEROWANEGO Z MINIKOMPUTERA MERA 303]
Adam Ciarkowski 1983 66 p In POLISH (ISSN-0208-5658) Copyright. Avail: Issuing Activity

The System of Programmed Synthesizer Service is proposed as a means of automating operator functions achieved during parametric speech synthesis with the help of the synthesizing computer system COMPUTALKER CT-1. The characteristics of the proposed system are described, with emphasis on the collaboration between the synthesizer and other internal devices within the computer system. The various functions of the system are shown in the form of block programs corresponding to the different functions. Complete evaluation of the system will be possible only after long-term synthetic speech experiments are concluded. Author

N84-33635 Polish Academy of Sciences, Warsaw.
SEGMENTATION OF THE SPEECH SIGNAL BASED ON CHANGES IN ENERGY DISTRIBUTION IN THE SPECTRUM [SEGMENTACJA SYGNALU MOWY NA PODSTAWIE ZMIAN ROZKLADU ENERGII W WIDME]
W. Jassem, H. Kudzdela, and P. Domagala 1983 24 p refs In POLISH (ISSN-0208-5658) Copyright. Avail: Issuing Activity

A simple algorithm is proposed for automatic phonetic segmentation of the acoustic speech signal on the MERA 303 desk-top minicomputer. The algorithm is verified with Polish linguistic material spoken by two subjects. The proposed algorithm detects approximately 80 percent of the boundaries between enunciated segments correctly, a result no worse than that obtained using more complex methods. Speech recognition programs are discussed as speech perception models, and the nature of categorical perception of human speech sounds is examined. Author

N84-33636 Forschungsinstitut fuer Hochfrequenzphysik, Werthoven (West Germany).
DOPPLER-BASED TARGET LOCALIZATION BY A DISTRIBUTED SYSTEM OF OMNIDIRECTIONAL SENSORS
E. Dommermuth Mar. 1984 18 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministeriums der Verteigigung (Rept-3-95; Lfd-222) Copyright. Avail: Issuing Activity

A multistatic SONAR system is presented. An omnidirectional transmitter and at least four omnidirectional receivers are used. Only Doppler measurements of the receiver are used for localization and speed estimation, assuming that the measuring accuracy is equal for all receivers. The resulting localization accuracy is better only for very long signals compared to theoretically estimated delay times. Author (ESA)

N84-33637# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
DETERMINATION OF MICROWAVE ATTENUATION DUE TO THE INFLUENCE OF ATMOSPHERIC GASES USING THE RADIOMETRIC TECHNIQUE [DETERMINACAO DA ATENUACAO DE MICROONDAS PELA INFLUENCIA DOS GASES ATMOSFERICOS, ATRAVES DE TECNICA RADIOMETRICA]
R. E. Schaal and C. B. Georges Aug. 1983 12 p refs In PORTUGUESE A Ser Publicado Nos Anais do 3rd Simposio Brasileiro Micro-Eletronica
(INPE-2850-PRE/391) Avail: NTIS HC A02/MF A01

A radiometer was constructed for atmospheric radiation measurement at 22 GHz wavelength in a study of the coefficient of microwave attenuation. Simultaneous measurements were taken by meteorologic radiosonde in the Brazilian city of Bauru in January 1983. It was confirmed that this simple model of radioactive transference satisfies the correlation between microwave attenuation and the quantity of water vapor in the atmosphere.
Transl. by B.G.

N84-33638# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
FM SYNTHESIZER-MODULATOR WITH 1200 CHANNELS FOR SCPC TRANSMISSION OF VOICE SIGNALS BY SATELLITE [SINTETIZADOR/MODULADOR FM DE 1200 CANAIS PARA TRANSMISSAO SCPC DE SINAIS DE VOZ POR SATELITE]
Paulo Adabo Jul. 1983 11 p refs In PORTUGUESE Presented at the 1st Simposio Brasileiro de Telecommunicacoes, PUC/RJ, 5-9 Sep. 1983
(INPE-2815-PRE/371) Avail: NTIS HC A02/MF A01

Practical implementation of a synthesizer at 52,020 to 87, 990 MHz wavelength with frequency increments of 30 KHz is described. The phase-locked loop (PLL) technique of synthesis, also known as coherent indirect synthesis, is utilized. This technique involves the use of the PLL technique for frequency division. The MC4044 integrated circuit also is employed. The synthesizer also functions as an FM modulator capable of generating 1200 channels in an SCPC (single channel per carrier) terrestrial station. Its energy consumption is low, about 5 watts. Transl. by B.G.

N84-33639# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
DECOMMUTATION SYSTEM M.S. Thesis [SISTEMA DE COMUTACAO]
Etiene Monteiro Schneider 3 Sep. 1984 21 p refs In PORTUGUESE; ENGLISH summary
(INPE-3148-NTE/220) Avail: NTIS HC A02/MF A01

The decommutation system is one of the most important down link components, performing a fundamental work in the satellite transmitted data retrieval. A decommutation system that is compatible with the present and future standards is presented.
Author

N84-33640# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
ELECTROMAGNETIC WAVE PROPAGATION IN MAGNETOIONIC MEDIA [PROPAGACAO DE ONDAS ELETROMAGNETICAS EM MEIOD MAGNETOIONICOS]
R. A. Medrano-B. Jul. 1984 32 p refs In PORTUGUESE; ENGLISH summary Presented at the 36th Reuinao Anual da SBPC, Sao Paulo, Brazil, 4-11 Jul. 1984
(INPE-3189-PRE/553) Avail: NTIS HC A03/MF A01

Starting from the Maxwell's equations, the propagation characteristics of electromagnetic waves in vacuum are determined. The validity of the hydrodynamic approximation used is justified and the tensor conductivity of the magnetoionic medium is derived. Next, by applying the Maxwell's equations to this medium, the dispersion relation (Appleton-Hartree formula) is determined. The wave polarization is defined and its mathematical expression in terms of the plasma parameters is derived. Finally, the wave propagation characteristics and their physical interpretation, in terms of the Appleton-Hartree formula and wave polarization, are determined stressing the results by their applications. Author

N84-33641*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
DEVELOPMENT OF A 611 MHz FEED FOR A 9-METER REFLECTOR
M. C. Bailey and B. B. Hefner, Jr. Aug. 1984 27 p refs
(NASA-TM-86300; NAS 1.15:86300) Avail: NTIS HC A03/MF A01 CSCL 20N

A 2 by 2 array of fan dipoles was designed as a feed for an existing 9.14 meter diameter reflector. Baffles (conducting fences) were utilized to reduce mutual coupling between dipoles and to improve the feed radiation pattern in the H plane. Significant strut scattering effects are noted in the secondary patterns of the reflector antenna. E.A.K.

N84-33642*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PHOTOVOLTAIC POWER SYSTEM FOR SATELLITE EARTH STATIONS IN REMOTE AREAS: PROJECT STATUS AND DESIGN DESCRIPTION
Richard DeLombard 1983 14 p refs Presented at the Intern. Telecommun. Energy Conf., New Orleans, 4-7 Nov. 1984; sponsored by the Communications Society of the Institute of Electrical and Electronics Engineers
(NASA-TM-83789; E-2285; NAS 1.15:83789) Avail: NTIS HC A02/MF A01 CSCL 20N

A photovoltaic power system which will be installed at a remote location in Indonesia to provide power for a satellite Earth station and a classroom for video and audio teleconferences are described. The Earth station may also provide telephone service to a nearby village. The use of satellite communications for development assistance applications and the suitability of a hybrid photovoltaic engine generator power system for remote satellite Earth stations are demonstrated. The Indonesian rural satellite project is discussed and the photovoltaic power system is described. E.A.K.

N84-33643# University of Southern California, Marina del Rey. Information Sciences Inst.
SATELLITE COMMUNICATION OF REAL-TIME PACKET VIDEO IMAGES
D. Cohen Jun. 1984 13 p Presented at the 7th Intern. Conf. on Computer Commun., Sydney, 30 Oct. - 2 Nov. 1984
(Contract MDA903-81-C-0335)
(AD-A143613; ISI/RS-84-136) Avail: NTIS HC A02/MF A01 CSCL 17/2

The paper describes major issues and problems in the use of packet satellite channels for real-time video images and suggests some solutions. The DARPA Wide Band Communication Network provides the testbed for this activity. A major idea in this paper is the automatic tradeoff between the quality and the dynamics of the communicated images in order to optimally adapt to the changes of the channel performance and to the changes of the scene to be communicated. Extensive work has been performed in the past both on packet-satellite and on real-time digital video. The paper reports work which uses both of these technologies to achieve their marriage in the form of packet satellite real-time video communication. The paper suggests several techniques and describes some new approaches to encoding real-time video communication. Section 2 describes issues which are in the application of packet satellite channels for real-time video communication. Section 3 shows a general approach which addresses these issues. Section 4 describes a general methodology for signal coding and compression, and shows how it may take advantage of time coherence by using time differences while reducing quantization errors at the same time. Section 5 shows a technique for encoding dynamic values, suited for the automatic tradeoff of motion (dynamics) and sharpness. As a public service this paper is accompanied by list of references regarding packet satellite channels. GRA

N84-33644# Rome Air Development Center, Griffiss AFB, N.Y.
REDUCING GRATING LOBES DUE TO SUBARRAY AMPLITUDE TAPERING
R. L. Haupt Apr. 1984 38 p

(AD-A143644; RADC-TR-84-94) Avail: NTIS HC A03/MF A01 CSCL 20/14

Subarray amplitude tapering is a simple, lower cost method to generate low sidelobes in an antenna's far field pattern. Unfortunately, this simple technique also generates unwanted grating lobes. Placing the exact amplitude taper at the element outputs produces the desired far field pattern, but the architecture is complicated and expensive. This report describes an alternative to these two techniques. A trade-off exists between sidelobe performance and simplicity of design. This trade-off consists of amplitude tapering the subarray outputs and the element outputs in such a way that the element amplitude tapers are identical for every subarray. In this way, the amplitude taper approximates the desired taper much better than subarray tapering alone, yet all the subarrays are identical. Thus, the design remains very simple. Author (GRA)

N84-33645# Royal Australian Navy Research Lab., Edgecliff.
THE CALCULATION OF THE RADAR VERTICAL COVERAGE DIAGRAM
M. R. Battaglia May 1984 46 p
(AD-A143647; RANRL-T/NOTE(EXT)-1/84) Avail: NTIS HC A03/MF A01 CSCL 17/9

Algorithms are described for the calculation and plotting of radar vertical coverage diagrams. Two contour VCD algorithms are presented, with a brief discussion on the problem of numerical stability, and the effects of ship motion and frequency agility. Author (GRA)

N84-33646# California Univ., Los Angeles. Integrated Electromagnetics Lab.
CRITERIA FOR NEARLY OMNIDIRECTIONAL RADIATION PATTERNS FOR PRINTED ANTENNAS
N. G. Alexopoulos, D. R. Jackson, and P. B. Katehi 31 May 1984 47 p Sponsored in part by Northrup Corp.
(Contract DAAG29-83-K-0067)
(AD-A143662; UCLA-ENG-84-13; UCLA-12; ARO-19778.4-EL) Avail: NTIS HC A03/MF A01 CSCL 20/14

Radiation from printed antennas is investigated with emphasis placed on producing E- and H-plane radiation patterns which are as nearly omnidirectional as possible. This is achieved using criteria which are derived for a nonzero radiation field extending down to the layer surface (radiation into the horizon). It is determined that this phenomenon arises when a surface wave pole coincides with a branch point in the complex plane. A simple ray optics interpretation is given for a phenomenon, and graphs are presented to easily enable design of printed antenna geometry to achieve nearly omnidirectional E- or H-plane patterns. Author (GRA)

N84-33647# Signatron, Inc., Lexington, Mass.
THEORETICAL ANALYSIS OF MICROWAVE PROPAGATION Final Report, Sep. 1980 - Sep. 1983
S. Parl and A. Malaga Griffiss AFB, N.Y. RADC Apr. 1984 412 p
(Contract F19628-80-C-0106)
(AD-A143762; RADC-TR-84-74) Avail: NTIS HC A18/MF A01 CSCL 20/14

This report documents a comprehensive investigation of microwave propagation. The structure of line-of-sight multipath is determined and the impact on practical diversity is discussed. A new model of diffraction propagation for multiple rounded obstacles is developed. A troposcatter model valid at microwave frequencies is described. New results for the power impulse response, and the delay spread and Doppler spread are developed. A 2-component model separating large and small scale scatter effects is proposed. The prediction techniques for diffraction and troposcatter have been implemented in a computer program intended as a tool to analyze propagation experiments. Author (GRA)

N84-33648# Illinois Univ., Urbana. Coordinated Science Lab.
SIGNAL DETECTION IN MULTIPLE-ACCESS CHANNELS Final Report, 21 May 1981 - 20 May 1984
H. V. Poor 18 Jul. 1984 9 p
(Contract DAAG29-81-K-0062)
(AD-A143796; ARO-17761.15-EL) Avail: NTIS HC A02/MF A01 CSCL 17/2

The overall purpose of this research project was to seek new methods for improving the robustness and efficiency of multiplier-user communications systems. The principal approach used was to consider the multiple-user communications problem from the viewpoint of signal detection theory, which focuses attention on the analysis and optimum design of receivers. GRA

N84-33649# Sperry Corp., Clearwater, Fla.
RADIO FREQUENCY DISTRIBUTION ASSEMBLY, OPERATIONS AND MAINTENANCE MANUAL
Sep. 1983 45 p
(Contract N00014-82-C-2147)
(AD-A143864; SJ-8230-36063-2) Avail: NTIS HC A03/MF A01 CSCL 09/5

The Naval Research Laboratory (NRL) Radio Frequency Distribution Assembly (RFDA) is an interface between the Sperry four-channel, fast-switching synthesizer and the EF-111 jamming system antenna ports. The RFDA will distribute the RF energy while providing controlled RF amplitude to simulate the antenna patterns of the EF-111 Electronic Warfare (EW) systems. The RFDA is capable of operating over the frequency range of 0.5 to 18 GHz, and can rapidly switch between varying frequencies and attenuation levels. GRA

N84-33650# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
PROBLEMS OF DIFFRACTION AND PROPAGATION OF WAVES (SELECTED ARTICLES)
G. I. Makarov, N. P. Tikhomirov, and V. M. Vyatkin 16 Jul. 1984 39 p Transl. into ENGLISH from Probl. Difraktsii i Rasprostraneniya Voln (USSR), no. 10, 141-143 1970 p 116-131
(AD-A143912; FTD-ID(RS)T-0953-84) Avail: NTIS HC A03/MF A01 CSCL 20/14

The first particle presented concerns the Tropospheric Refraction or radio waves, or more specifically, direct and inverse problems of diffraction on the impedance sphere of a large radius. The exponential profile, which is a precise approximation of the regular component of the atmospheric heterogeneity of the Earth, is selected. Concerning tropospheric refraction, different profiles were studied: bilinear; exponential; and the more general profiles. The second article concerns the refinement of Booker's equation for cylindrical layered inhomogeneous anisotropic media. Booker's equation was originally derived for the case of plane layered anisotropic medium. It is necessary to refine Booker's equation considering the final curvature and terrestrial magnetic field of the modified ionosphere. It was found that the values of the roots of Booker's equation decrease in comparison with the flat plane case, and the effect of final curvature of the ionosphere and magnetic bump of the Earth on the height is manifested such that WKB approximation is inapplicable. S.B.

N84-33651# California Univ., Los Angeles. Integrated Electromagnetics lab.
ON THE MODELING OF ELECTROMAGNETICALLY COUPLED MICROSTRIP ANTENNAS: THE PRINTED STRIP DIPOLE
P. B. Katehi and N. G. Alexopoulos 30 Apr. 1984 27 p
(Contracts DAAG29-83-K-0067; N00014-79-C-0856)
(AD-A143927; UCLA-ENG-84-12; UCLA-13; ARO-19778.3-EL) Avail: NTIS HC A03/MF A01 CSCL 09/5

A generalized solution for a class of printed circuit antennas, excited by a strip transmission line is presented. The strip transmission line may be embedded inside or printed on the substrate. As an example, microstrip dipoles electromagnetically coupled (parasitically excited) to embedded strip transmission line have been analyzed accurately and design graphs are provided for a specific substrate material. These graphs permit the establishment of a design procedure which yields the microstrip dipole length, overlap, offset, and substrate thickness with the goal of a desired input match for a given substrate material. The method accounts for conductor thickness and for arbitrary substrate

parameters. Comparison with experiment shows excellent agreement. Author (GRA)

N84-33652# Harry Diamond Labs., Adelphi, Md.
THE CONCENTRIC SPHERICAL CAVITY TE AND TM (TRANSVERSE ELECTROMAGNETIC AND TRANSVERSE MAGNETIC) EIGENVALUES
L. F. Libelo and M. Campi Jul. 1984 91 p
(DA Proj. 1L1-61102-AH-44)
(AD-A143985; HDL-TR-2038) Avail: NTIS HC A05/MF A01 CSCL 20/3

The eigenvalue problem for the concentric spherical cavity has been extensively investigated. This simple system is an important starting point for a number of important practical problems. In this report, the basic field theory for the eigenmodes and eigenvalues is formulated. We investigate the effect of a lossy dielectric on these properties and determine a large number of transverse electromagnetic and transverse magnetic (TE and TM) eigenvalues as a function of the cavity dimensions. The results given in tabular as well as graphical form reveal some rather unexpected properties. Author (GRA)

N84-33653# Research Inst. of National Defence, Linkoeping (Sweden). Dept. 3.
RADIO SPECTRUM CONSERVATION TECHNIQUE
Stefan Mattsson Feb. 1984 33 p refs In SWEDISH; ENGLISH summary Report of Intern. Conf., Birmingham, England, 6-8 Sep. 1983
(FOA-C-30358-E2; ISSN-0347-3708) Avail: NTIS HC A03/MF A01; Research Institute of National Defence, Stockholm KR 50

Problems of interference linked to high demand on spectrum efficiency in mobile radio, digital radiolinks, cellular radio systems, and satellite communication; wave propagation; networks; electromagnetic compatibility; and modulation techniques were discussed. Author (ESA)

N84-33654# Forschungsinstitut der Deutschen Bundespost, Darmstadt (West Germany).
GENERATION OF TWO STAGE RANDOM GRAPHS [ERZEUGUNG ZWEISTIFUGER SUFALLSGRAPHEN]
Manfred Koerkel Feb. 1984 22 p In GERMAN; ENGLISH summary
(FI-032-TB-16) Avail: NTIS HC A02/MF A01

Optimization of telecommunication networks using weighted random graphs is discussed. A random graph generator was used for independent definition of graph size, geographical structure, interconnection, multipath transmission, and edge load. The method systematically assembles graphs without sacrificing randomness. Author (ESA)

N84-33655# ERA Ltd., Leatherhead (England). RF Technology Centre.
EVALUATION OF MICROSTRIP RADIATORS AS FEEDS FOR REFLECTOR ANTENNA Final Report
C. D. Hills ESA Apr. 1983 69 p refs
(Contract ESTEC-5169/82/NL-GM(SC))
(ERA-83-0056; ESA-CR(P)-1899) Avail: NTIS HC A04/MF A01

The potential of microstrip radiators as feeds for reflector antenna configurations compatible with multiple beam and scanning applications was investigated. While the microstrip array feeds offer many advantages over conventional waveguide systems, particularly with regard to mass, volume and cost, significant research and development effort is required before they can be applied to meet satellite communications systems specifications. Shortcomings are in bandwidth and the general degradations in the pattern characteristics caused by the effects of mutual coupling and the feedline radiation. Problems may be overcome by exploiting the advantages of beam forming at IF where the control devices are much easier to produce and the insertion and feed losses are less critical. Author (ESA)

N84-33656# Instituto de Electronica de Communicaciones, Madrid (Spain).
DEVELOPMENT OF A SLOTTED WAVEGUIDE ARRAY PANEL FOR SAR ANTENNA: ELECTRICAL DESIGN AND TESTING Final Report
N. E. Jensen, A. Saitto, J. Barbero, F. Jimenez Asenjo (Construcciones Aeronauticas S.A.), J. L. Fontecha (Construcciones Aeronauticas S.A.), M.A. Liorca (Instituto Nacional de Tecnica Aerospacial, Madrid), A. Nunez (Instituto Nacional de Tecnica Aerospacial, Madrid), J. Torres (M. J. Fernandez), F. Vila (TICRA Engineering Consultants), M. Fernandez et al May 1983 284 p refs
(Contract ESTEC-4345/80/NL-PP(SC))
(IEC-MO-80/11; ESA-CR(P)-1903) Avail: NTIS HC A13/MF A01

The design, construction, and characterization, with aluminum technology, of a 1 sqm representative panel of a 10 sqm SAR antenna are outlined. Experimental results agree closely with expected radiation characteristics. The feeding network was developed by studying each component independently, then in assembly. Components behaved in good agreement with the foreseen results, but for the inclined series coupling slots between waveguides, higher losses than expected are detected. A model allowing the computation of the losses in each case and so, the choice of the different parameters involved, in order to minimize those losses, was developed. In the assembly of the feeding network, the compatibility among the components was studied. Author (ESA)

N84-33657# Joint Publications Research Service, Arlington, Va.
WORLDWIDE REPORT: TELECOMMUNICATIONS POLICY, RESEARCH AND DEVELOPMENT
26 Sep. 1984 95 p Transl. into ENGLISH from various worldwide articles
(JPRS-TTP-84-029) Avail: NTIS HC A05/MF A01

International research and development in telecommunication policies were reviewed. The following topics are discussed: local satellite manufacturing, telecommunication equipment development, telephony, telecommunication satellites, information systems, satellite communication systems, TV transmission, satellite networks, communication networks. For individual titles, see N84-33658 through N84-33659.

N84-33658# Joint Publications Research Service, Arlington, Va.
STAND ON SPACE STATION PARTICIPATION TO BE SURVEYED c18
In its Worldwide Rept.: Telecommun. Policy, Res. and Develop. 26 Sep. 1984 p 20-21 Repr. from The Toronto Star (Toronto), 25 Jul. 1984 p A19 (For primary document see N84-33657 23-32)
Avail: NTIS HC A05/MF A01

The building of a permanent orbiting space station which will use the low gravity, near perfect vacuum to produce better, cheaper products than their Earth bound competitors is discussed. The the Canadian government, which is trying to raise the profile of its own space program, is excited at the prospect of an extraterrestrial partnership. Opportunities in areas such as communications, remote sensing, space science and technology are investigated. Tangible commercial benefits the space station could offer are questioned. Benefits the station for Canadian manufacturing are examined, and the potential of each project are considered. The feasibility of joining the space station is studied. E.A.K.

N84-33659# Joint Publications Research Service, Arlington, Va.
PERSPECTIVES ON EUROPEAN SATELLITE COMMUNICATIONS
Herbert Weber *In its* Worldwide Rept: Telecommun. Policy, Res. and Develop. 26 Sep. 1984 p 59-67 Transl. into ENGLISH from Tech. Rundschau (Bern), 31 Jul. 1984 p 12-13; 15 (For primary document see N84-33657 23-32)
Avail: NTIS HC A05/MF A01

The Intelsat System is the classic intercontinental transmission system for television signals and large FDM beams is outlined. An important medium for the transmission of small beams and of individual telephone communication traffic. With its satellites of continuously increasing size and complexity the fifth generation is

now in operation, the sixth in development it provides the following capacities in several areas of its radiation: the 6/4-GHz range (C band) and the 14/11-GHz range (Ku band). The prevailing transmission technology in the Intelsat System was analog, however changeover to digital transmission technology with pulse code modulation (PCM) as source coding and using time division multiple access (TDMA), has commenced with the construction of the ground stations. E.A.K.

N84-33937# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Hochfrequenztechnik.
COHERENT POLARIMETRIC C-BAND RADAR FOR ATMOSPHERIC RESEARCH
A. Schroth, P. Meischner, and H. Schuster *In* ESA IGARSS 84. Remote Sensing: From Res. towards Operational Use, Vol. 1 Aug. 1984 p 497-505 refs (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

N84-33940# Schlumberger Well Surveying Corp., Houston, Tex.
RADIAL INVERSION OF TE MEASUREMENTS IN A BOREHOLE
Gerald N. Minerbo *In* ESA IGARSS 84. Remote Sensing: From Res. towards Operational Use, Vol. 1 Aug. 1984 p 517-529 refs (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

N84-33941# Arizona Univ., Tucson. Electromagnetics Lab.
TRANSIENT RESPONSE FROM THIN DYKE IN THE EARTH FOR LOOP EXCITATION
Allen Q. Howard *In* ESA IGARSS 84. Remote Sensing: From Res. towards Operational Use, Vol. 1 Aug. 1984 p 531-536 refs (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

N84-33947*# Environmental Research Inst. of Michigan, Ann Arbor. Radar Div.
ANALYSIS OF BISTATIC SAR SIGNATURES
E. S. Kasischke, R. W. Larson, P. L. Jackson, and B. A. Burns *In* ESA IGARSS 84: Remote Sensing: From Res. towards Operational Use, Vol. 2 Aug. 1984 p 561-567 refs Sponsored by Internal Research and Development Funds (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 17I

N84-33949*# National Space Development Agency, Tokyo (Japan).
AN R AND D MODEL OF A SYNTHETIC APERTURE RADAR ANTENNA
N. Imura (Mitsubishi Electric Corp., Hyogo, Japan), A. Akaishi (Mitsubishi Electric Corp., Hyogo, Japan), M. Ono (Mitsubishi Electric Corp., Hyogo, Japan), Y. Hisada, and Y. Itoh *In* ESA IGARSS 84: Remote Sensing: From Res. towards Operational Use, Vol. 2 Aug. 1984 p 573-578 refs (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 17I

N84-33950*# INTERA Environmental Consultants Ltd., Ottawa (Ontario).
OPTIMIZING IMAGE QUALITY FOR SAR
R. T. Lowry, G. W. Wessells, and D. R. Inkster *In* ESA IGARSS 84: Remote Sensing: From Res. towards Operational Use, Vol. 2 Aug. 1984 p 579-593 refs (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 17I

N84-33951*# Marconi Co. Ltd., Chelmsford (England).
MEASUREMENT OF GEOMETRIC DISTORTION IN AIRBORNE SAR IMAGES
S. Quegan *In* ESA IGARSS 84: Remote Sensing: From Res. towards Operational Use, Vol. 2 Aug. 1984 p 595-599 refs Sponsored by ESRIN, Frascati, Italy (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 17I

N84-33953*# Technische Univ., Berlin (West Germany). Inst. fuer Luft- und Raumfahrt.
COMPACT RECEIVERS FOR SHUTTLE IMAGING RADAR (SIR)-B SAR MISSION
A. Gnaedig, W. Schaeffer, Ph. Hartl (Stuttgart Univ.), K. Chowdhu (Stuttgart Univ.), B. Seshu (DFVLR, Oberpfaffenhofen, West Germany), and A. Sieber *In* ESA IGARSS 84: Remote Sensing: From Res. towards Operational Use, Vol. 2 Aug. 1984 p 607-610 ref (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 17I

N84-33954*# Environmental Research Inst. of Michigan, Ann Arbor. Radar Div.
DIGITAL PROCESSING AND ABSOLUTE CALIBRATION OF A STRIPMAP SYNTHETIC APERTURE RADAR
P. L. Jackson, R. W. Larson, A. Dias, and D. B. Franczak *In* ESA IGARSS 84: Remote Sensing: From Res. towards Operational Use, Vol. 2 Aug. 1984 p 611-614 refs (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 17I

N84-33957*# Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.
THE EFFECT OF WAVELENGTH FILTERING IN ROUGH SURFACE SCATTERING
A. K. Fung and M. F. Chen *In* ESA IGARSS 84: Remote Sensing: From Res. towards Operational Use, Vol. 2 Aug. 1984 p 631-637 refs (For primary document see N84-33946 23-43) (Grant NSF ECS-83-02087)
Avail: NTIS HC A15/MF A01 CSCL 20N

N84-33958*# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany).
SIMULATION OF SHUTTLE IMAGING RADAR (SIR)-B IMAGERY OVER FREIBURG TEST SITE
A. J. Sieber, A. Popella, and Ph. Hartl (Stuttgart Univ.) *In* ESA IGARSS 84: Remote Sensing: From Res. towards Operational Use, Vol. 2 Aug. 1984 p 639-642 refs (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 17I

N84-33981*# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
SPECTRASAT: A CONCEPT FOR THE COLLECTION OF GLOBAL DIRECTIONAL WAVE SPECTRA
Robert C. Beal *In* ESA IGARSS 84 Remote Sensing: From Res. towards Operational Use, Vol. 2 Aug. 1984 p 781-786 refs Sponsored in part by Navy (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 17I

N84-33982*# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
THE NAVY GEOSAT MISSION RADAR ALTIMETER SATELLITE PROGRAM
C. C. Kilgus and J. L. MacArthur *In* ESA IGARSS 84 Remote Sensing: From Res. Towards Operational Use, Vol. 2 Aug. 1984 p 787-790 refs (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 14B

N84-33985*# Canada Centre for Remote Sensing, Ottawa (Ontario).
CONCEPTUAL DESIGN OF SATELLITE SAR
R. K. Raney *In* ESA IGARSS 84 Remote Sensing: From Res. Towards Operational Use, Vol. 2 Aug. 1984 p 801-807 refs (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 20N

N84-33986*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE VENUS RADAR MAPPER: RADAR SYSTEM DESIGN FOR

HIGHLY ELLIPTICAL ORBITS
William T. K. Johnson *In* ESA IGARSS 84 Remote Sensing: from Res. Towards Operational Use, Vol. 2 Aug. 1984 p 809-813 refs Sponsored by NASA (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 17I

N84-33987*# Nippon Electric Co. Ltd., Tokyo (Japan).
A CASE STUDY OF SPACEBORNE SYNTHETIC APERTURE RADAR SYSTEM DESIGN FOR THE EARTH RESOURCES SATELLITE
H. Kashihara, K. Tanaka, M. Fukai, J. Komai (Earth Resources Satellite Data Analysis Center, Tokyo), and M. Sano (Earth Resources Satellite Data Analysis Center, Tokyo) *In* ESA IGARSS 84 Remote Sensing: From Res. Towards Operational Use, Vol. 2 Aug. 1984 p 815-820 refs (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 17I

N84-33988*# Nippon Electric Co. Ltd., Tokyo (Japan).
SOME TEST RESULTS OF SYNTHETIC APERTURE RADAR TRANSMITTER AND RECEIVER
M. Fukai, K. Tanaka, H. Kashihara, L. Izumi, E. Kadota, E. Takano, Y. Itoh (National Space Development Agency, Ibaraki, Japan), and Y. Hisada (National Space Development Agency, Ibaraki, Japan) *In* ESA IGARSS 84 Remote Sensing: From Res. Towards Operational Use, Vol. 2 Aug. 1984 p 821-825 ref (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 17I

N84-33989*# Marconi Space and Defence Systems Ltd., Portsmouth (England).
ERS SYNTHETIC APERTURE RADAR DESIGN
F. G. Sawyer, R. P. Cox, and H. Joyce *In* ESA IGARSS 84 Remote Sensing: From Res. Towards Operational Use, Vol. 2 Aug. 1984 p 287-832 refs (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 17I

N84-33992*# Marconi Space and Defence Systems Ltd., Portsmouth (England).
VERIFICATION TECHNIQUES FOR SATELLITE-BORNE SYNTHETIC APERTURE RADARS
R. P. Cox and F. G. Sawyer *In* ESA IGARSS 84 Remote Sensing : From Res. Towards Operational Use, Vol. 2 Aug. 1984 p 847-852 (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 17I

N84-33995*# Marconi Co. Ltd., Chelmsford (England).
DIRECT AND INVERSE METHODS FOR OCEAN-WAVE IMAGING BY SAR
S. Rotheram and J. T. Macklin *In* ESA IGARSS 84 Remote Sensing: From Res. Towards Operational Use, Vol. 2 Aug. 1984 p 865-870 refs Sponsored in part by ESA Original contains color illustrations (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 17I

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics.*

N84-33660* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
COUPLING AN INDUCTION MOTOR TYPE GENERATOR TO ac POWER LINES Patent
Frank J. Nola, inventor (to NASA) Issued 25 Sep. 1984 11 p Filed 31 Mar. 1983 Supersedes N83-24768 (21 - 14, p 2208) Continuation-in-part of US Patent-4,388,585, US Patent Appl-SN-243683, filed 16 Mar. 1981
(NASA-Case-MFS-25302-2; NAS 1.71:MFS-25302-2; US-Patent-4,473,792; US-Patent-Appl-SN-481086; US-Patent-Class-322-47; US-Patent-Class-322-29; US-Patent-Class-322-25; US-Patent-Class-322-95; US-Patent-Class-307-87; US-Patent-4,388,585; US-Patent-Appl-SN-243683) Avail: US Patent and Trademark Office CSCL 09C

A system for coupling an induction motor type generator to an A.C. power line includes an electronic switch means that is controlled by a control system and is regulated to turn on at a relatively late point in each half cycle of its operation. The energizing power supplied by the line to the induction motor type generator is decreased and the net power delivered to the line is increased. Official Gazette of the U.S. Patent and Trademark Office

N84-33661* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
THREE-PHASE POWER FACTOR CONTROLLER WITH INDUCED EMF SENSING Patent
Frank J. Nola, inventor (to NASA) Issued 4 Sep. 1984 10 p Filed 16 Dec. 1982 Supersedes N83-17803 (21 - 08, p 1176)
(NASA-Case-MFS-25852-1; NAS 1.71:MFS-25852-1; US-Patent-4,469,998; US-Patent-Appl-SN-450319; US-Patent-Class-318-729; US-Patent-Class-318-802) Avail: US Patent and Trademark Office CSCL 09C

A power factor controller for an ac induction motor is provided which is of the type comprising thyristor switches connected in series with the motor, phase detectors for sensing the motor current and voltage and providing an output proportional to the phase difference between the motor voltage and current, and a control circuit, responsive to the output of the phase detector and to a power factor command signal, for controlling switching of the thyristor. The invention involves sensing the induced emf produced by the motor during the time interval when the thyristor is off and for producing a corresponding feedback signal for controlling switching of the thyristor. The sensed emf is also used to enhance soft starting of the motor. Official Gazette of the U.S. Patent and Trademark Office

N84-33662 Polish Academy of Sciences, Warsaw.
USE OF METHODS OF TRANSMISSION LINE ELECTRICAL THEORIES TO ANALYZE ONE-DIMENSIONAL DYNAMIC PROBLEMS OF CONSOLIDATION THEORY [ZASTOSOWANIE METOD TEORII ELEKTRYCZNYCH LINH PRZESYLOWYCH DO ANALIZY JEDNOWYMIAROWYCH ZAGADNIEN DYNAMICZNYCH TEORII KONSOLIDACJI]
R. Uklejewski 1983 25 p In POLISH
(ISSN-0208-5658) Copyright. Avail: Issuing Activity

An electrical analog of an uniaxial dynamic state of deformation of a porous center is presented. With the use of methods and concepts of transmission line electrical theories, a general solution is developed for a uniaxial state of deformation of a porous center under conditions of a sinusoidal course characterized by arbitrarily large pulsation. The occurrence of two types of waves associated with different propagation constants is observed. The general solution for arbitrary pulsations is reduced to the solution for quasistatistical problems presented in Uklejewski's works on electromechanical analogies for the theory of consolidation.Author

N84-33663* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SIMPLIFIED dc TO dc CONVERTER Patent
Robert P. Gruber, inventor (to NASA) Issued 7 Aug. 1984 9 p Filed 14 Apr. 1982 Supersedes N82-24432 (20 - 15, p 2079)
(NASA-Case-LEW-13495-1; NAS 1.71:LEW-13495-1; US-Patent-4,464,710; US-Patent-Appl-SN-368188; US-Patent-Class-363-22; US-Patent-Class-363-49; US-Patent-Class-323-901) Avail: US Patent and Trademark Office CSCL 09A

A dc to dc converter which can start with a shorted output

and which regulates output voltage and current is described. Voltage controlled switches directed current through the primary of a transformer the secondary of which includes virtual reactance. The switching frequency of the switches is appropriately varied to increase the voltage drop across the virtual reactance in the secondary winding to which there is connected a low impedance load. A starting circuit suitable for voltage switching devices is provided. Official Gazette of the U.S. Patent and Trademark Office

N84-33664 California Univ., Berkeley.
OPTIMAL PERFORMANCE IN A STEP MOTOR CONTROLLED ROBOT Ph.D. Thesis
Moshe Niv 1983 141 p
Avail: Univ. Microfilms Order No. DA8413538

A step motor equipped robot is studied mainly from the control point of view. Step motors are used widely in industry, mostly for position control purposes. As an actuator it combines qualities which make it attractive for robotics uses. It is a digital device, does not need extra measurements for position and velocity, such as shaft encoders, and it can be easily braked. In general, on the system level a step motor equipped robot requires less computer power and fewer hardware devices. In order to make use of these advantages, a mechanical manipulator without feedback was chosen to be the model for this research, and as a result, preview control calculations were necessary. The Maximum principle theorem was used to design an optimal control based on minimum time for a specified motion. With the use of an optimization technique the optimal control problem was solved numerically using the complete, highly nonlinear dynamic model of the manipulator. Dissert. Abstr.

N84-33665 Department of the Air Force, Washington, D.C.
FET SWITCHING REGULATOR Patent
D. G. Miller, inventor (to Air Force) Issued 19 Jun. 1984 8 p Supersedes AD-D009706
(AD-D011146; US-Patent-4,455,526; US-Patent-Appl-SN-393265; US-Patent-Class-323-282) Avail: US Patent and Trademark Office CSCL 10/2

The high voltage field effect transistor has a drive circuit for pulse width modulation, which includes a small transformer coupled to the gate and source with a diode in series at the gate, so that a very short on-drive pulse charges the gate capacitance, and the charge is held by the diode. Another FET has its output connected between the gate and source of the high voltage FET, and its input coupled to another small transformer so that it is turned on for a short time by a very short off-drive pulse to discharge the gate capacitance and thus turn off the high voltage FET. A transformer drive circuit includes two one-shot devices connected to the pulse width modulator as leading and trailing edge detectors respectively, with their outputs connected via FET's to the on-drive and off-drive transformer primaries respectively, to provide pulses of 100-200 nanoseconds. Author (GRA)

N84-33666 Department of the Air Force, Washington, D.C.
PROCESS FOR MAKING A FLUID-COOLED ELECTRICAL CONDUCTOR Patent
F. B. McCarty, inventor (to Air Force) Issued 15 May 1984 7 p
(AD-D011150; US-Patent-4,447,947; US-Patent-Appl-SN-465214; US-Patent-Class-29-825) Avail: US Patent and Trademark Office CSCL 09/1

A fluid-cooled electrical conductor having excellent heat transfer, low eddy loss, and good space factor is made by encapsulating small magnet wire strands, which constitute an electrically conductive member, in a meltable matrix that supports the wire; wrapping the matrix with an insulating tape having a silicone adhesive backing and thereby forming an insulating member that surrounds the matrix; perforating the insulating member so that an inlet and an outlet are formed through which an insulating coolant fluid can flow; and heating, melting, and removing the meltable matrix. Author (GRA)

N84-33667 Department of the Air Force, Washington, D.C.
ELECTRONIC CANCELLING OF ACOUSTIC TRAVELING WAVES Patent
C. J. Swigert, inventor (to Air Force) Issued 15 May 1984 6 p Supersedes AD-D009770
(AD-D011153; US-Patent-4,449,235; US-Patent-Appl-SN-398131; US-Patent-Class-381-71) Avail: US Patent and Trademark Office CSCL 09/1

An acoustic disturbance in a thin support rod may be suppressed by detecting the disturbance, and processing the detected signal with electronic circuits to generate two output signals, which are injected into the rod at spatially separate positions. It is the solution of the waveforms for the output signals that is the essence of the technique. The principal component of the electronic circuits is an integrator. There are also delay devices and summing circuits. Author (GRA)

N84-33668*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE 1983 GODDARD SPACE FLIGHT CENTER BATTERY WORKSHOP
D. Baer, ed. and G. W. Morrow, ed. Washington Sep. 1984 548 p refs Workshop held in Greenbelt, Md., 15-17 Nov. 1983 (NASA-CP-2331; NAS 1.55:2331) Avail: NTIS HC A23/MF A01 CSCL 10C

Subjects covered included advanced energy storage programs, lithium cell technology, nickel cadmium technology, testing and flight experience and metal hydrogen technology. For individual titles, see N84-33669 through N84-33704.

N84-33669*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INERTIAL ENERGY STORAGE FOR SPACECRAFT c44
G. Ernest Rodriguez *In its* The 1983 Goddard Space Flight Center Battery Workshop Sep. 1984 p 3-22 refs (For primary document see N84-33668 23-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

The feasibility of inertial energy storage in a spacecraft power system is evaluated on the basis of a conceptual integrated design that encompasses a composite rotor, magnetic suspension and a permanent magnet (PM) motor/generator for a 3-kW orbital average payload at a bus distribution voltage of 250 volts dc. The conceptual design, is referred to as a Mechanical Capacitor. The baseline power system configuration selected is a series system employing peak-power-tracking for a Low Earth-Orbiting application. Power processing, required in the motor/generator, provides potential alternative that can only be achieved in systems with electrochemical energy storage by the addition of power processing components. One such alternative configuration provides for peak-power-tracking of the solar array and still maintains a regulated bus, without the expense of additional power processing components. Precise speed control of the two counterrotating wheels is required to reduce interaction with the attitude control system (ACS) or alternatively, used to perform attitude control functions. Author

N84-33670*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
REGENERATIVE HYDROGEN-OXYGEN FUEL CELL-ELECTROLYZER SYSTEMS FOR ORBITAL ENERGY STORAGE
Dean W. Sheibley *In* NASA. Goddard Space Flight Center The 1983 Goddard Space Flight Center Battery Workshop Sep. 1984 p 23-42 refs (For primary document see N84-33668 23-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

Fuel cells have found application in space since Gemini. Over the years technology advances have been factored into the mainstream hardware programs. Performance levels and service lives have been gradually improving. More recently, the storage application for fuel cell-electrolyzer combinations are receiving considerable emphasis. The regenerative system application described here is part of a NASA Fuel Cell Program which was developed to advance the fuel cell and electrolyzer technology required to satisfy the identified power generation and energy storage need of the Agency for space transportation and orbital applications to the year 2000. Author

N84-33671*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
CHARGE CONTROL INVESTIGATION OF RECHARGEABLE LITHIUM CELLS
Burton Otzinger and Robert Somoano *In* NASA. Goddard Space Flight Center The 1983 Goddard Space Flight Center Battery Workshop Sep. 1984 p 45-63 refs Prepared in cooperation with Rockwell International Corp., Downey, Calif. (For primary document see N84-33668 23-33)
(Contract NAS7-918)
Avail: NTIS HC A23/MF A01 CSCL 10C

An ambient temperature rechargeable Li-TiS2 cell was cycled under conditions which simulate aerospace applications. A novel charge/discharge state-of-charge control scheme was used, together with tapered current charging, to overcome deleterious effects associated with end-of-charge and end-of-discharge voltages. The study indicates that Li-TiS2 cells hold promise for eventual synchronous satellite-type applications. Problem areas associated with performance degradation and reconditioning effects are identified. Author

N84-33672*# Moli Energy Ltd., Burnaby (British Columbia).
PERFORMANCE AND SAFETY CHARACTERISTICS OF LITHIUM-MOLYBDENUM DISULFIDE CELLS
J. A. Stiles *In* NASA. Goddard Space Flight Center The 1983 Goddard Space Flight Center Battery Workshop Sep. 1984 p 65-85 (For primary document see N84-33668 23-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

The lithium-molybdenum disulfide system offers attractive characteristics including high rate capability, successful operation up to 75 C, a very low self-discharge rate, a good cycle life and safety characteristics which compare favorably to those of other lithium cells. Moreover, the materials and manufacturing costs for the system is effectively controlled, so the cells should ultimately be competitive with currently marketed rechargeable cells. Author

N84-33673*# Electrochem Industries, Inc., Clarence, N.Y.
CHARACTERIZATION OF OPEN CIRCUIT VOLTAGE AND CAPACITY AS A FUNCTION OF TIME
Paul W. Krehl and Russell C. Stinebring *In* NASA. Goddard Space Flight Center The 1983 Goddard Space Flight Center Battery Workshop Sep. 1984 p 87-96 ref (For primary document see N84-33668 23-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

It is noted from the data presented that Li/BCX cells lose approximately 8% of their rated capacity in the first 2 months of storage. After this period of time, little difference is noted in the average realized capacity; however, a significant increase in the range is observed. Over the same period of time the OCV falls at a rate of 0.02V per 1,000 hours. After a period of 8,000 hours the OCV appears stabilize at a value of approximately 3.75V. This may be related to changes in Cl2 concentration due to self-discharge or other reactions. These data indicate that no correlation exists between the reduced open circuit voltage and the realized capacity. Author

N84-33674*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
CHARACTERIZATION OF GLASS FIBER SEPARATOR MATERIAL FOR LITHIUM BATTERIES
S. Subbarao and H. Frank *In* NASA. Goddard Space Flight Center The 1983 Goddard Space Flight Center Battery Workshop Sep. 1984 p 97-108 refs (For primary document see N84-33668 23-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

Characterization studies were carried out on a glass fiber paper that is currently employed as a separator material for some LiSOCl2 primary cells. The material is of the non-woven type made from microfilaments of E-type glass and contains an ethyl acrylate binder. Results from extraction studies and tensile testing revealed that the binder content and tensile strength of the paper were significantly less than values specified by the manufacturer. Scanning electron micrographs revealed the presence of clusters of impurities many of which were high in iron content. Results of emission spectroscopy revealed high overall levels of iron and leaching, followed by atomic absorption measurements, revealed that essentially all of this iron is soluble in SOCl2. B.G.

N84-33675*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
KINETICS OF OPEN CIRCUIT PROCESSES IN UNDISCHARGED LI/SOCI2 CELLS
Lee D. Hansen and Harvey Frank *In* NASA. Goddard Space Flight Center The 1983 Goddard Space Flight Center Battery Workshop Sep. 1984 p 109-116 refs Prepared in cooperation with Brigham Young Univ., Provo, Utah (For primary document see N84-33668 23-33)
(Contract NAS7-100)
(Contrib-336) Avail: NTIS HC A23/MF A01 CSCL 10C

The kinetics of the heat producing processes in undischarged Li/SOCl2 cells under open circuit conditions were measured by heat-conduction microcalorimetry. The cells studied, Honeywell type G2666 reserve cells, were activated as needed and the rate of open circuit heat output determined as a function of time since activation and temperature. The results at each temperature can be described by an equation of the form $q = Bktx$ where q is the rate of heat output, B is the heat produced per unit of reaction, k and x are empirical constants, and t is the time since activation. Both x and k are found to be functions of temperature; therefore, accelerated testing at elevated temperatures is probably not valid for these cells until the processes involved are better understood. Author

N84-33676*# Honeywell Power Sources Center, Horsham, Pa.
RELATED STUDIES IN LONG TERM LITHIUM BATTERY STABILITY
R. J. Horning and D. L. Chua *In* NASA. Goddard Space Flight Center The 1983 Goddard Space Flight Center Battery Workshop Sep. 1984 p 117-128 (For primary document see N84-33668 23-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

The continuing growth of the use of lithium electrochemical systems in a wide variety of both military and industrial applications is primarily a result of the significant benefits associated with the technology such as high energy density, wide temperature operation and long term stability. The stability or long term storage capability of a battery is a function of several factors, each important to the overall storage life and, therefore, each potentially a problem area if not addressed during the design, development and evaluation phases of the product cycle. Design (e.g., reserve vs active), inherent material thermal stability, material compatibility and self-discharge characteristics are examples of factors key to the storability of a power source. Author

N84-33677*# Naval Surface Weapons Center, White Oak, Md.
TESTING OF CANDIDATE BATTERIES FOR GLOBAL POSITIONING SYSTEM
James A. Barnes, F. C. DeBold, R. Frank Bis, Susan Buchholz, Patrick Davis, and L. A. Kowalchik *In* NASA. Goddard Space Flight Center The 1983 Goddard Space Flight Center Battery Workshop Sep. 1984 p 129-137 refs (For primary document see N84-33668 23-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

Three lithium batteries proposed as candidates for use in the Global Positioning System are studied. The batteries are discharged at several rates and temperatures both before and after environmental testing. Batteries are heated inside a closed chamber until they vent. Samples of the vented gases are analyzed for components which might be toxic. The test results raise concerns about each of the proposed batteries. M.A.C.

N84-33678*# Honeywell Power Sources Center, Horsham, Pa.
RESERVE LI/SOCI2 BATTERY SAFETY TESTING
C. T. Dils and K. F. Garoutte *In* NASA. Goddard Space Flight Center The 1983 Goddard Space Flight Center Battery Workshop Sep. 1984 p 139-148 Sponsored by Sandia Labs. (For primary

document see N84-33668 23-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

A reserve Lithium/Thionyl Chloride Battery concept is developed and undergoing feasibility testing in terms of performance, safety and abusive conditions. The feasibility of employing a battery of this type to replace thermal batteries in certain applications is demonstrated. Excellent performance of a Li/SOCl2 reserve battery is obtained across the temperature range from 0 C to +44 C. Performance improvement over the thermal battery usage is greater by a factor of 3 when discharge time and energy density are compared. Performance over an expanded temperature range is also possible. Safety and abusive testing is accomplished successfully on a series of five units. Further performance improvements can be achieved with regard to battery weight and volume reductions. M.A.C.

N84-33679*# Altus Corp., San Jose, Calif.
PERFORMANCE AND SAFETY TO NAVSEA INSTRUCTION 9310.1A OF LITHIUM-THIONYL CHLORIDE RESERVE BATTERIES
John C. Hall *In* NASA. Goddard Space Flight Center The 1983 Goddard Space Flight Center Battery Workshop Sep. 1984 p 149-158 (For primary document see N84-33668 23-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

The design, performance and safety of a fully engineered, selfcontained Li/SOCl2 battery as the power source for underwater applications. In addition to meeting the performance standards of the end user this battery is successfully tested under the rigorous safety conditions of NAVSEA Instruction 9310.1A for use on land, aircraft and surface ships. M.A.C.

N84-33680*# Naval Surface Weapons Center, White Oak, Md.
HIGH RATE DISCHARGE STUDIES OF LI/SO2 BATTERIES
James A. Barnes, Susan Buchholz, R. Frank Bis, F. C. DeBold, and L. A. Kowalchik *In* NASA. Goddard Space Flight Center The 1983 Goddard Space Flight Center Battery Workshop Sep. 1984 p 159-169 (For primary document see N84-33668 23-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

A battery composed of twelve lithium/sulfur dioxide D size cells in series is forced discharged at 21 amperes. This current is established by the proposed use of the battery and represented a discharge condition which might produce venting. Discharge of the battery into voltage reversal results not only in cells venting but also in the violent rupture of at least one cell. M.A.C.

N84-33681*# Eagle-Picher Industries, Inc., Joplin, Mo.
SHUNT DIODE DESIGNS IN LI/CF SHUTTLE BATTERIES
David Miller and Robert Higgins *In* NASA. Goddard Space Flight Center The 1983 Goddard Space Flight Center Battery Workshop Sep. 1984 p 171-182 (For primary document see N84-33668 23-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

Although Li/CF cells and batteries have an excellent safety record, they are included with other battery systems that require additional safety precautions. One precaution suggested is the inclusion of shunt diodes into these batteries. The benefits of this addition are examined. All cells tested at elevated temperatures vent regardless of length of time between being fully discharged and reversed or inclusion of the diode in the system. Cells discharged at ambient temperatures all show a relatively quick reversal, but stabilize at voltages that are high enough that the diodes are not functioning. Cells tested at depressed temperatures reverse the deepest of all cells tested, with the deepest reversal occurring very early in the test and voltages recovering to above -0.60 volts near the end of the tests. Anode limited cells will eliminate the venting during hot reversal. M.A.C.

N84-33682*# Aerospace Corp., El Segundo, Calif.
SEPARATOR QUALIFICATION FOR AEROSPACE NICKEL-CADMIUM CELLS
Martin J. Milden *In* NASA. Goddard Space Flight Center The 1983 Goddard Space Flight Center Battery Workshop Sep. 1984 p 185-197 (For primary document see N84-33668 23-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

The development plans for a new separator for nickel cadmium (NiCd) cells is described. Research includes acceptance testing, operation in a charge/discharge characterization matrix, and life testing in low earth orbit (LEO) and geosynchronous (GEO) orbit under real time and accelerated conditions. M.A.C.

N84-33683*# Eagle-Picher Industries, Inc., Colorado Springs, Colo.
ELECTROCHEMICALLY DEPOSITED CADMIUM ELECTRODE FOR SEALED Ni-Cd CELLS
William H. Houston and Tim A. Edgar *In* NASA. Goddard Space Flight Center The 1983 Goddard Space Flight Center Battery Workshop Sep. 1984 p 199-221 refs (For primary document see N84-33668 23-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

An investigation into the work on electrochemical cadmium deposition processes is described. A beaker impregnation system is constructed to investigate the practical limits of loading and the effect of various process parameters. Reasonably high loadings of cadmium are obtained and the process appears amenable to tight control and the production of uniform consistent electrodes. A pilot impregnation facility is built to further investigate electrodeposition processes. Both the inert anode and consummable anode processes are investigated. Results of this evaluation and an analysis of associated problems are presented. M.A.C.

N84-33684*# Bowie State Coll., Md.
SECOND PLATEAU VOLTAGE IN NICKEL-CADMIUM CELLS
Kunigahalli L. Vasanth *In* NASA. Goddard Space Flight Center The 1983 Goddard Space Flight Center Battery Workshop Sep. 1984 p 223-243 refs (For primary document see N84-33668 23-33)
(Grant NsG-5009)
Avail: NTIS HC A23/MF A01 CSCL 10C

Sealed nickel cadmium cells having large number of cycles on them are discharged using Hg/HgO reference electrode. The negative electrode exhibits the second plateau. A SEM of negative plates of such cells show a number of large crystals of cadmium hydroxide. The large crystals on the negative plates disappear after continuous overcharging in flooded cells. M.A.C.

N84-33685*# B-K Dynamics, Inc., Rockville, Md.
PREDICTION OF BATTERY LIFE AND BEHAVIOR FROM ANALYSIS OF VOLTAGE DATA
Patrick P. McDermott *In* NASA. Goddard Space Flight Center The 1983 Goddard Space Flight Center Battery Workshop Sep. 1984 p 245-261 (For primary document see N84-33668 23-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

A method for simulating charge and discharge characteristics of secondary batteries is discussed. The analysis utilizes a nonlinear regression technique where empirical data is computer fitted with a five coefficient nonlinear equation. The equations for charge and discharge voltage are identical except for a change of sign before the second and third terms. M.A.C.

N84-33686*# Hughes Aircraft Co., Los Angeles, Calif.
PREDICTION MODEL FOR THE LIFE OF NICKEL-CADMIUM BATTERIES IN GEOSYNCHRONOUS ORBIT SATELLITES
J. H. Engleman, M. B. Zirkes-Falco, R. S. Bogner, and D. F. Pickett, Jr. *In* NASA. Goddard Space Flight Center The 1983 Goddard Space Flight Center Battery Workshop Sep. 1984 p 263-273 refs (For primary document see N84-33668 23-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

A mathematical model is described which predicts the service life of nickel-cadmium batteries designed for geosynchronous orbit satellites. Regression analysis technique is used to analyze orbital data on second generation trickle charged batteries. The model gives average cell voltage as a function of design parameters, operating parameters and time. The voltage model has the properties of providing a good fit to the data, good predictive capability, and agreement with known battery performance characteristics. Average cell voltage can be predicted to within 0.02 volts for up to 8 years. This modeling shows that these

batteries will operate reliably for 10 years. Third-generation batteries are expected to operate even longer. M.A.C.

N84-33687*# GTE Satellite Corp., Princeton, N.J.
Ni-Cd BATTERY LIFE EXPECTANCY IN GEOSYNCHRONOUS ORBIT
Richard J. Broderick *In* NASA. Goddard Space Flight Center The 1983 Goddard Space Flight Center Battery Workshop Sep. 1984 p 275-289 (For primary document see N84-33668 23-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

The feasibility of using nickel cadmium batteries as an alternate if flight qualified NiH2 batteries are not available is explored. Battery life expectancy data being a key element of power system design, an attempt is made to review the literature, life test data and in orbit performance data to develop an up to date estimate of life expectancy for NiCd batteries in a geosynchronous orbit. E.R.

N84-33688*# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
NICKEL CADMIUM CHARGE CONTROL CONCEPTS
Ralph M. Sullivan *In* NASA. Goddard Space Flight Center The 1983 Goddard Space Flight Center Battery Workshop Sep. 1984 p 291-305 ref (For primary document see N84-33668 23-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

The design and testing of charge control concepts for several power systems is presented. The design of the CRAM charge control system for the SAS satellites and the design of the battery charge regulator for the AMPTE satellites is reviewed. Another charge control concept examined is for the OPEN program and its use of a microprocessor. The use of the voltage limiter is also discussed. E.R.

N84-33689*# Naval Research Lab., Washington, D. C.
DEEP RECONDITIONING TESTING FOR NEAR EARTH ORBITS
F. E. Betz and W. L. Barnes *In* NASA. Goddard Space Flight Center The 1983 Goddard Space Flight Center Battery Workshop Sep. 1984 p 309-323 refs (For primary document see N84-33668 23-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

The problems and benefits of deep reconditioning to near Earth orbit missions with high cycle life and shallow discharge depth requirements is discussed. A simple battery level approach to deep reconditioning of nickel cadmium batteries in near Earth orbit is considered. A test plan was developed to perform deep reconditioning in direct comparison with an alternative trickle charge approach. The results demonstrate that the deep reconditioning procedure described for near Earth orbit application is inferior to the alternative of trickle charging. E.R.

N84-33690*# Martin Marietta Aerospace, Denver, Colo.
IN FLIGHT PERFORMANCE OF A SIX AMPERE-HOUR NICKEL-CADMIUM BATTERY IN LOW EARTH ORBIT
Joseph K. McDermott *In* NASA. Goddard Space Flight Center The 1983 Goddard Space Flight Center Battery Workshop Sep. 1984 p 325-340 refs (For primary document see N84-33668 23-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

Flight data for 17,000 orbital cycles are reviewed and summarized. The nickel cadmium battery system operated without failure or abnormality. Battery trend analysis used in determining the feasibility of extending mission life is discussed. The life test data for 20% depth of discharge indicates design life requirements would be reached even at a deeper depth of discharge. E.R.

N84-33691*# RCA Astro-Electronics Div., Princeton, N. J.
RCA SATCOM BATTERY IN ORBIT PERFORMANCE UPDATE AND ACCELERATED LIFE TEST RESULTS
Stephen J. Gaston and Stephen F. Schiffer *In* NASA. Goddard Space Flight Center The 1983 Goddard Space Flight Center Battery Workshop Sep. 1984 p 341-352 refs (For primary document see N84-33668 23-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

No significant degradation of nickel cadmium battery performance in SATCOM F1 and F2 after almost 8 and 7-3/4 years in orbit was shown. Battery minimum discharge voltage data are presented for these spacecraft. In addition, 2 groups of nickel cadmium cells which are representative of those in orbit are undergoing real time eclipse-reduced suntime cycling in the laboratory. These groups of cells, which are being cycled at a maximum of 53% and 62% depth of discharge (based on actual capacity), have completed 14 and 15 eclipse seasons, respectively. Data for these groups of cells are presented and are compared with the in-orbit battery data. Author

N84-33692*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PERFORMANCE OF THE IUE SPACECRAFT BATTERIES AFTER 70 MONTHS
Smith E. Tiller *In its* The 1983 Goddard Space Flight Center Battery Workshop Sep. 1984 p 353-365 (For primary document see N84-33668 23-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

The battery performance of the IUE spacecraft launched in 1977 is updated. Changes made in the battery operational procedures are detailed. The aging effects after several eclipse seasons and the effects of 8 C temperature was anticipated. The batteries met their design goals and should meet the 10 year goal. E.R.

N84-33693*# ISRO Satellite Centre, Peenya, Bangalore (India).
MANAGEMENT AND PERFORMANCE OF APPLE BATTERY IN HIGH TEMPERATURE ENVIRONMENT
M. S. Suresh, A. Subrahmanyam, and B. L. Agrawal *In* NASA. Goddard Space Flight Center The 1983 Goddard Space Flight Center Battery Workshop Sep. 1984 p 367-383 (For primary document see N84-33668 23-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

India's first experimental communication satellite, APPLE, carried a 12 AH Ni-Cd battery for supplying power during eclipse. Failure to deploy one of the two solar panels resulted in the battery operating in a high temperature environment, around 40 C. This also resulted in the battery being used in diurnal cycles rather than just half yearly eclipse seasons. The management and performance of the battery during its life of two years are described. An attempt to identify the probable degradation mechanisms is also made. Author

N84-33694*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
COMPARISON OF STANDARD AND HEART-PACER TYPE 3RD ELECTRODES IN DESIGN VARIABLE CELLS
George W. Morrow *In its* The 1983 Goddard Space Flight Center Battery Workshop Sep. 1984 p 385-399 ref (For primary document see N84-33668 23-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

Nine packs of sealed aerospace nickel cadmium cells were put on life test in February 1979. Each 5 cell pack contained one cell with a standard sensor signal electrode and one cell with a new heart pacer sensor signal electrode. Testing was discontinued in May 1983 and the signal electrode performance data was studied. It was found that the heart pacer electrode generally provided a greater voltage swing over a cycle; that both types of electrodes lost significant sensitivity during life, and that both types of electrodes show great signal variation from cell to cell.
Author

N84-33695*# Boeing Aerospace Co., Seattle, Wash.
SPECIAL TEST METHODS FOR BATTERIES
Sidney Gross *In* NASA. Goddard Space Flight Center The 1983 Goddard Space Flight Center Battery Workshop Sep. 1984 p 401-418 refs (For primary document see N84-33668 23-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

Various methods are described for measuring heat generation in primary and secondary batteries as well as the specific heat of batteries and cell thermal conductance. Problems associated with

determining heat generation in large batteries are examined. Special attention is given to monitoring temperature gradients in nickel cadmium cells, the use of auxiliary electrodes for conducting tests on battery charge control, evaluating the linear sweep of current from charge to discharge, and determining zero current voltage. The fast transient behavior of batteries in the microsecond range, and the electrical conductance of nickel sinters in the thickness direction are also considered. Mechanical problems experienced in the vibration of Ni-Cd batteries and tests to simulate cyclic fatigue of the steel table connecting the plates to the comb are considered. Methods of defining the distribution of forces when cells are compressed during battery packaging are also explored. A.R.H.

N84-33696*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
EMU BATTERY/MODULE SERVICE TOOL CHARACTERIZATION STUDY
Charles F. Palandati *In its* The 1983 Goddard Space Flight Center Battery Workshop Sep. 1984 p 419-432 refs (For primary document see N84-33668 23-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

The power tool which will be used to replace the attitude control system in the SMM spacecraft is being modified to operate from a self contained battery. The extravehicular mobility unit (EMU) battery, a silver zinc battery, was tested for the power tool application. The results obtained during show the EMU battery is capable of operating the power tool within the pulse current range of 2.0 to 15.0 amperes and battery temperature range of -10 to 40 degrees Celsius. R.J.F.

N84-33697*# TRW Space Technology Labs., Redondo Beach, Calif.
PRELIMINARY SILVER-HYDROGEN CELL TEST RESULTS
Charles Lurie *In* NASA. Goddard Space Flight Center The 1983 Goddard Space Flight Center Battery Workshop Sep. 1984 p 435-447 ref (For primary document see N84-33668 23-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

Silver-hydrogen cells were tested. The objective of the test was to estimate useful life by operation at accelerated, simulated geosynchronous orbit conditions. Ten simulated seasons were run and are summarized. The results to-date reflect stable, trouble-free performance and indicate that the silver-hydrogen couple shows promise as a lightweight alternative to the nickel systems. R.J.F.

N84-33698*# Hughes Research Labs., Malibu, Calif.
LONG LIFE NICKEL ELECTRODES FOR A NICKEL-HYDROGEN CELL: CYCLE LIFE TESTS
H. S. Lim and S. A. Verzwyvelt *In* NASA. Goddard Space Flight Center The 1983 Goddard Space Flight Center Battery Workshop Sep. 1984 p 449-462 refs (For primary document see N84-33668 23-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

In order to develop a long life nickel electrode for a Ni/H2 cell, cycle life tests of nickel electrodes were carried out in Hi/H2 boiler plate cells. A 19 test cell matrix was made of various nickel electrode designs including three levels each of plaque mechanical strength, median pore size of the plaque, and active material loading. Test cells were cycled to the end of their life (0.5v) in a 45-minute low earth orbit cycle regime at 80% depth-of-discharge. The results show that the active material loading level affects the cycle life the most with the optimum loading at 1.6 g/cc void. Mechanical strength did not affect the cycle life noticeably in the bend strength range of 400 to 700 psi. The best plaque type appears to be one which is made of INCO nickel powder type 287 and has a median pore size of 13 micron. R.J.F.

N84-33699*# Communications Satellite Corp., El Segundo, Calif.
FACTORS AFFECTING NICKEL-OXIDE ELECTRODE CAPACITY IN NICKEL-HYDROGEN CELLS
Paul F. Ritterman *In* NASA. Goddard Space Flight Center The 1983 Goddard Space Flight Center Battery Workshop Sep. 1984 p 463-472 refs (For primary document see N84-33668 23-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

The nickel-oxide electrode common to the nickel hydrogen and nickel cadmium cell is by design the limiting or capacity determining electrode on both charge and discharge. The useable discharge capacity from this electrode, and since it is the limiting electrode, the useable discharge capacity of the cell as well, can and is optimized by rate of charge, charge temperature and additives to electrode and electrolyte. Recent tests with nickel hydrogen cells and tests performed almost 25 years ago with nickel cadmium cells indicate an improvement of capacity as a result of using increased electrolyte concentration. R.J.F.

N84-33700*# Eagle-Picher Industries, Inc., Colorado Springs, Colo.
POSITIVE ELECTRODE FABRICATION FOR BI-POLAR NI-H2 CELLS
Tim A. Edgar *In* NASA. Goddard Space Flight Center The 1983 Goddard Space Flight Center Battery Workshop Sep. 1984 p 473-494 refs Sponsored by NASA. Lewis Research Center (For primary document see N84-33668 23-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

Bi-Polar nickel hydrogen design studies indicated a potential improvement in energy density and specific energy if positive electrodes could be manufactured in configurations of twice or more of the present normal thickness. Such electrodes would have to achieve similar active material loading, utilization, and cycle life to conventional 0.8mm I.P.U. nickel hydrogen electrodes. A capability for producing 1.0mm dry sinter and 1.5mm slurry sinter structures on production processes and equipment was demonstrated. The EPI/USAF electrochemical impregnation process proved capable of loading thick electrodes to 1.60 g/cubic centimeters void or higher. Sample electrodes incurred 2000 high rate stress cycles without significant structural or performance degradation. Formation regimes developed for thin plaque are not optimal for thick plaque and further investigation into electrode capacity build-up would seem warranted. Thick electrode technology development is continuing under other programs and shows promise of fulfilling the projected energy density and specific energy improvements. R.J.F.

N84-33701*# Ford Aerospace and Communications Corp., Palo Alto, Calif.
BIPOLAR NICKEL-HYDROGEN BATTERIES FOR AEROSPACE APPLICATIONS
C. W. Koehler, G. VanOmmering, N. H. Puester, and V. J. Puglisi *In* NASA. Goddard Space Flight Center The 1983 Goddard Space Flight Center Battery Workshop Sep. 1984 p 495-505 Prepared in cooperation with Yardney Electric Corp., Pawcatuck, Conn. (For primary document see N84-33668 23-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

A bipolar nickel-hydrogen battery which effectively addresses all key requirements for a spacecraft power system, including long-term reliability and low mass, is discussed. The design of this battery is discussed in the context of system requirements and nickel-hydrogen battery technology in general. To achieve the ultimate goal of an aerospace application of a bipolar Ni-H2 battery several objectives must be met in the design and development of the system. These objectives include: maximization of reliability and life; high specific energy and energy density; reasonable cost of manufacture, test, and integration; and ease in scaling for growth in power requirements. These basic objectives translate into a number of specific design requirements, which are discussed. R.J.F.

N84-33702*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TEST RESULTS OF A TEN CELL BIPOLAR NICKEL-HYDROGEN BATTERY
Robert L. Cataldo *In* NASA. Goddard Space Flight Center The 1983 Goddard Space Flight Center Battery Workshop Sep. 1984 p 507-521 refs (For primary document see N84-33668 23-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

A study was initiated to design and evaluate a new design

concept for nickel-hydrogen cells. This concept involved constructing a battery in a bipolar stack with cells consisting of a one plate for each nickel and hydrogen electrode. Preliminary designs at the system level of this concept promised improvements in both volumetric and gravimetric energy densities, thermal management, life extension, costs, and peak power capability over more conventional designs. Test results were most encouraging. This preprototype battery, built with less than ideal components and hardware, exceeded expectations. A total of 2000 LEO cycles at 80 percent depth of discharge were accrued. A cycle life goal of 30,000 cycles appears achievable with minor design changes. These improvements include advanced technology nickel electrodes, insulated bipolar plates and specifically designed frames to minimize shunt currents. The discharge rate capability of this design exceeds 25C. At the 10C discharge rate, 80% of the battery capacity can be withdrawn in six minutes. This data shows that the bipolar design is well suited for those applications requiring high peak power pulses. R.J.F.

N84-33703*# McDonnell-Douglas Astronautics Co., St. Louis, Mo.
FAILURE ANALYSIS OF NICKEL-HYDROGEN CELL SUBJECTED TO SIMULATED LOW EARTH ORBIT CYCLING
Vernon C. Mueller *In* NASA. Goddard Space Flight Center The 1983 Goddard Space Flight Center Battery Workshop Sep. 1984 p 523-538 (For primary document see N84-33668 23-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

A nickel-hydrogen cell completed 10,080 simulated low earth orbit charge/discharge cycles at depths-of-discharge ranging from 50 to 80 percent prior to failure. The cell is of the Air Force design, rated at 50 ampere-hours, 8.9 cm (3.5 inches) in diameter. Upon disassembly, the end of the polysulfone core supporting the electrode stack was found to have fractured. This allowed the electrode stack to expand. A massive short was found at the inner diameter of the electrodes centered roughly at plate set 34 to 37 from the positive end of the electrode stack. The damaged area extended through approximately one third of the electrode stack, with the effect becoming progressively less with distance from plate set 34 to 37. Measured thicknesses of the positive plates were significantly greater than the initial specification values. The postulated cause of failure is that positive plate growth caused fracture of the shoulder from the end of the polysulfone core on which the electrodes are mounted. The electrode stack relieved and pressure points were created at the area near the inner diameter of the plates at the tab attachment. A short occurred at a pressure point between opposing plates and propagated to other electrode sets due to thermal and mechanical stresses caused by the short. R.J.F.

N84-33704*# International Telecommunications Satellite Organization, Washington, D. C.
COMPARATIVE PERFORMANCE ASSESSMENT OF INTELSAT 5 NICKEL HYDROGEN AND NICKEL CADMIUM BATTERIES
D. Cooper and A. Ozkul *In* NASA. Goddard Space Flight Center The 1983 Goddard Space Flight Center Battery Workshop Sep. 1984 p 539-555 (For primary document see N84-33668 23-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

The first Nickel Hydrogen battery deployment onboard a commercial geosynchronous communications satellite was realized with the launch of the INTELSAT 5, Flight 6 spacecraft on 19 May 1983. The initial five spacecrafts in this series are equipped with Nickel Cadmium batteries. Based on the data available on both types of batteries, design and operational performance comparisons of INTELSAT 5 Nickel Cadmium batteries are presented. General characteristics of the INTELSAT 5 spacecraft as related to electrical-power-subsystem functions and battery operations are summarized. Author

N84-33705# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
ANALYSIS OF MICROSTRIP LINE TOLERANCE USING THE MONTE-CARLO METHOD [ANALISE DE TOLERANCIAS DE UMA LINHA EM MICROSTRIP PELO METODO MONTE-CARLO]
Eduardo Antonio Parada Tude and Mauricio Garcia Chiarello Jul. 1983 12 p refs In PORTUGUESE Presented at the 1st Simposio Brasileiro de Telecommunicacoes, PUC/RJ, 5-9 Sep. 1983
(INPE-2814-PRE/370) Avail: NTIS HC A02/MF A01

The effect of W, H, and E(r) tolerances on the impedance and effect of a microstrip line was analyzed with the Monte Carlo method. Z distribution and Duroid dielectric substrate effect were investigated, and their respective sensitivities were calculated. Various methods can be used to calculate the impedance and epsilon effect of a microstrip line. Effects such as dispersion of frequency, anisotropy, and pressure of the conducting substrate are influenced by line width and other manufacturing criteria. The Monte Carlo method utilizes circuit tolerances, and it lends itself particularly well to the analysis of a combination of microwave circuit lines. B.G.

N84-33706# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
MICROWAVE BANDSTOP FILTERS AS DIELECTRIC RESONATORS [FILTROS REJEITA-FAIXA COM RESSOADOR DIELECTRICO EM MICROFITA]
Paulo Mello Marshall Apr. 1984 10 p refs In PORTUGUESE Presented at the 2nd Simp. Brasileiro de Telecomunicacoes, no Centro de Pesquisa e Desenvolvimento da Telebras, em Campinas, SP, 3-6 Sep. 1984
(INPE-3055-PRE/475) Avail: NTIS HC A02/MF A01

An experimental method which describes the use of microwave bandstop filters as resonators by coupling the resenator to the microstrip line is presented. This project required the use of a 4.45 GHz bandstop filter of a 6/4 GHz recepter such as the one used in the ANIK-B satellite. When compared to parallel coupled line filters, which are normally used for such application, the filter proved superior with respect to wave attenuation through 3.7 to 4.2 GHz. This is the main qualititative advantage of dielectric resonators, they are about 20 times better than microstrip line resonators. Recent advances in the area of controlling the temperature coefficient of the dielectric constant have made it feasible to create filters in the range of 0-2 ppm/C. If these criteria are met, microstrip filters as dielectric resonators will be suitable for use in communication satellite receptors. Transl. by B.G.

N84-33707# Tohoku Univ., Sendai (Japan). Research Inst. of Electrical Communication.
THE RECORD OF ELECTRICAL AND COMMUNICATION ENGINEERING CONVERSAZIONE, VOLUME 52, NO. 3, FEBRUARY 1984
Feb. 1984 55 p refs In JAPANESE and ENGLISH
(ISSN-0385-7719) Avail: NTIS HC A04/MF A01

Prospects for the optical computer, the design of an English language word processor for scientific and technical use, and the loudness of complex noise are discussed. For individual titles, see N84-33708 through N84-33711.

N84-33708# Tohoku Univ., Sendai (Japan).
THE 19TH ELECTRICAL COMMUNICATION RESEARCH INSTITUTE SYMPOSIUM: FUTURE PROSPECTS FOR THE OPTICAL COMPUTER
In its The Record of Elec. and Commun. Eng. Conversazione, Vol. 52, No. 3, Feb. 1984 Feb. 1984 p 62-81 In JAPANESE (For primary document see N84-33707 23-33)
Avail: NTIS HC A04/MF A01

The proceedings of the panel discussion on future prospects for the optical computer at the 19th symposium titled Approaches to Optical Computer held on March 10 and 11, 1983 are presented. The topics include: the need for and kinds of optical image/information processing and analysis, revolutionizing algorithm, optical fiber communication, optical fiber sensor, software and optical computing, hybrid of analog and digital, optical disc versus magnetic disc, digital/optical processing of microwave signals, electron versus photon, high speed photo detector, control of photon, semiconductor laser, and optical correlator. The optical computer will be developed in 20 to 30 years. Main drawbacks at the moment seem to be the astronomical cost of manufacturing

and/or the very low feasibility of mass production as well as the choice between digital linear processing and two-dimensional analog processing. Transl. by B.G.

N84-33709# Tohoku Univ., Sendai (Japan).
THE DESIGN OF AN ENGLISH WORD-PROCESSOR FOR SCIENTIFIC AND TECHNICAL USE IN WHICH SUPERSCRIPTS, SUBSCRIPTS AND GREEK CHARACTERS ARE OPERATED IN ONE-TOUCH, 1 **c82**
In its The Record of Elec. and Commun. Eng. Conversazione, Vol. 52, No. 3, Feb. 1984 Feb. 1984 p 82-93 refs In JAPANESE (For primary document see N84-33707 23-33)
Avail: NTIS HC A04/MF A01

The design, specification, and method of operation of an English word-processor for scientific and technical use are described. The input and output display images are the same as the printer output. Table 1 shows different system programs featuring the printer output for an equation as an example. Besides complicated input operation, all systems except the present EWP-B either require type element changes or versatec/laser printers to produce the above printer output. The present system consists of Basic program called EWP-B and the machine language program called EWP-M. The input operation of superscripts and subscripts is done without the use of commannd but by the movement of cursors only. To adjust the size of Greek characters, dot patterns for the display and the printer, respectively were prepared. The number of Greek and other special characters packaged at one time is 45, and memory file of those is called pattern package. Pattern package 1 of chart number 4 shows an arrangement of special characters on the keyboard. The present word processor is also equipped with the usual FILL, PAGE, JUSTIFY, etc. Transl. by B.G.

N84-33710# Tohoku Univ., Sendai (Japan).
THE DESIGN OF AN ENGLISH WORD-PROCESSOR FOR SCIENTIFIC AND TECHNICAL USE IN WHICH SUPERSCRIPTS, SUBSCRIPTS AND GREEK CHARACTERS ARE OPERATED IN ONE-TOUCH, 2 **c82**
Susumu Mashiko and Shigetoshi Katsura *In its* The Record of Elec. and Commun. Eng. Conversazione, Vol. 52, No. 3, Feb. 1984 Feb. 1984 p 94-100 refs In JAPANESE; ENGLISH summary (For primary document see N84-33707 23-33)
Avail: NTIS HC A04/MF A01

The system program is outlined and flow charts are given for a word processor in which superscripts and subscripts, and Greek characters are operated in one touch, and in which input and output display images are the same as the printer output. The system for making pattern packages is also described. Author

N84-33711# Tohoku Univ., Sendai (Japan).
THE LOUDNESS OF COMPLEX NOISE CONSISTED OF IMPACT SOUND AND STEADY NOISE **c71**
Yoiti Suzuki, Masazumi Kumagai, Yoshiaki Inaba, and Toshio Sone *In its* The Record of Elec. and Commun. Eng. Conversazione, Vol. 52, No. 3, Feb. 1984 Feb. 1984 p 101-112 refs In JAPANESE; ENGLISH summary (For primary document see N84-33707 23-33)
Avail: NTIS HC A04/MF A01

The loudness of complex noise, which includes noises originating from various kinds of noise sources and differing in their natures was experimentally studied. As a simple case, a model complex noise consisted of some impact sound and a steady noise was used as a test stimulus in our psycho-acoustical experiment. The experiment proves that masking between the impact sound and the steady noise causes smaller loudness than expected by a simple energy summation of the components, except when the steady noise and the impact sound have the similar spectra. Then the loudness of complex noise is estimated from the loudness of the steady noise and the masked loudness of the impact sound. This calculated loudness shows a good agreement, in most cases, with the result of the experiment. Author

N84-33712# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
A MICROWAVE OSCILLATOR CONTROLLED BY PRESSURE AND STABILIZED BY A 1250 MHz CAVITY RESONATOR [OSCILADOR DE MICROONDAS CONTROLADO POR TENSAO E ESTABILIZADO FOR CAVIDADE RESSONANTE EM 1250 MHZ]
Paulo M. Marshall Jul. 1984 18 p refs In PORTUGUESE; ENGLISH summary Presented at the 36th Reuniao Anual da Socieda de Brasileira para o Progresso da Ciencia - SBPC, Sao Paulo, Brazil, 4-11 Jul. 1984
(INPE-3173-PRE/543) Avail: NTIS HC A02/MF A01

The design and performance of a cavity-stabilized voltage controlled oscillator are described. The equipment is to operate as the VCO of a frequency synthesizer for an SCPC FM low-capacity Earth station. Author

N84-33713# Bureau of Mines, Minneapolis, Minn.
BATTERY SAFETY PROCEDURES FOR SURFACE-MINING EQUIPMENT
James C. Mitchell 1984 60 p refs
(LC-84-600162) Avail: NTIS HC A04/MF A01

Battery safety procedures for those who work in surface mines are discussed. Battery construction, principles of operation, installation, service procedures, and testing are explained. S.B.

N84-33714*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
THEORETICAL AND EXPERIMENTAL STUDIES OF ERROR IN SQUARE-LAW DETECTOR CIRCUITS
William D. Stanley (Old Dominion Univ.), Chase P. Hearn, and James B. Williams Sep. 1984 75 p refs
(NASA-TM-86307; NAS 1.15:86307) Avail: NTIS HC A04/MF A01 CSCL 09C

Square law detector circuits to determine errors from the ideal input/output characteristic function were investigated. The non-linear circuit response is analyzed by a power series expansion containing terms through the fourth degree, from which the significant deviation from square law can be predicted. Both fixed bias current and flexible bias current configurations are considered. The latter case corresponds with the situation where the mean current can change with the application of a signal. Experimental investigations of the circuit arrangements are described. Agreement between the analytical models and the experimental results are established. Factors which contribute to differences under certain conditions are outlined. E.A.K.

N84-33715*# LNR Communications, Inc., Hauppauge, N. Y.
THE 20 GHz SOLID STATE TRANSMITTER DESIGN, IMPATT DIODE DEVELOPMENT AND RELIABILITY ASSESSMENT Final Report
S. Picone, Y. Cho, and J. R. Asmus Jun. 1984 503 p
(Contract NAS3-22491)
(NASA-CR-174716; NAS 1.26:174716; LNR-300) Avail: NTIS HC A22/MF A01 CSCL 09A

A single drift gallium arsenide (GaAs) Schottky barrier IMPATT diode and related components were developed. The IMPATT diode reliability was assessed. A proof of concept solid state transmitter design and a technology assessment study were performed. The transmitter design utilizes technology which, upon implementation, will demonstrate readiness for development of a POC model within the 1982 time frame and will provide an information base for flight hardware capable of deployment in a 1985 to 1990 demonstrational 30/20 GHz satellite communication system. Life test data for Schottky barrier GaAs diodes and grown junction GaAs diodes are described. The results demonstrate the viability of GaAs IMPATTs as high performance, reliable RF power sources which, based on the recommendation made herein, will surpass device reliability requirements consistent with a ten year spaceborne solid state power amplifier mission. B.G.

N84-33716# Rockwell International Corp., Thousand Oaks, Calif. Microelectronics Research and Development Center.
MONOLITHIC SAW OSCILLATORS ON SILICON Final Report, 15 Sep. 1982 - 14 Sep. 1983

M. E. Motamedi and M. K. Kilcoyne Apr. 1984 50 p
(Contract F49620-82-C-0094)
(AD-A143664; MRDC41125.1FR; AFOSR-84-0557TR) Avail: NTIS HC A03/MF A01 CSCL 09/5

In this report progress in development of a monolithic SAW silicon resonator is described. Specific studies and results in the areas of piezoelectric films for generation and detection of SAW are presented. A multi-mode SAW resonator using thin film ZnO on silicon was designed, fabricated and characterized. Methods were developed for a new technique of fabricating silicon SAW resonator cavity using orientational etching. It was concluded that this type of etching results in well-defined sidewall structures for reflector cavity element, producing a superior resonant performance with lower phase noise than conventional SAW resonators. Automated measurement equipment was employed to evaluate devices and confirm equivalent circuit models. Device performance very closely matched original circuit models showing excellent confirmation of design parameters. Author (GRA)

N84-33717# Naval Surface Weapons Center, White Oak, Md.
BATTERY MATERIAL SYMPOSIUM
L. E. DeVries Oct. 1983 21 p Symp. held at Brussels, 14-16 Sep. 1983
(F33-321)
(AD-A143815; NSWC/TR-83-448) Avail: NTIS HC A02/MF A01 CSCL 10/3

Papers presented at the first symposium of the Battery Material Research Association in Brussels, Belgium covered a wide range of topics on the current research being done on battery materials. Information was given on the production and performance of battery materials, thermodynamics of electro-chemical reactions, corrosion of battery materials, and rechargeable systems. Author (GRA)

N84-33718# Syracuse Univ., N. Y. Dept. of Electrical and Computer Engineering.
CALCULATION OF THE EXCESS INDUCTANCE OF A MICROSTRIP DISCONTINUITY
J. R. Mautz and R. F. Harrington May 1984 75 p
(Contract N00014-76-C-0225)
(AD-A143819; SYRU/DECE/TR-84/5; TR-25) Avail: NTIS HC A04/MF A01 CSCL 09/1

A numerical solution for the excess inductance of a microstrip discontinuity is obtained by the method of moments. This discontinuity is a via between two semi-infinite infinitesimally thin perfectly conducting strips. Above a ground plane, these strips are immersed in a medium that has constant permeability. Both strips run in the z-direction, but they are not necessarily collinear. The excess inductance is the inductance in excess of that which would result if the asymptotic inductance per unit length was assumed to exist up to $z=0$ on the left-hand strip and beginning with $z=0$ on the right-hand strip. The asymptotic inductance per unit length of one of the strips is that which would exist if the strip was infinitely long. Author (GRA)

N84-33719# ITT Aerospace/Optical Div., Fort Wayne, Ind.
STUDY IN SPURIOUS SENSITIVITY OF ELECTRONICS Quarterly Report, 1 Jan. - 31 Mar. 1984
D. M. Yeager 29 Mar. 1984 8 p
(Contract F49620-83-C-0153)
(AD-A143947; AFOSR-84-0624TR; QR-2) Avail: NTIS HC A02/MF A01 CSCL 09/1

A measurement program in which a proton beam irradiates sensitive electro-optical sensors used in spacecraft systems has been prepared. The progress reported during this period includes device procurement and testing of photomultiplier tubes at the Los Alamos Meson Physics Facility. The micropulse structure of the LAMPF beam is ideal for measuring transient response of the photomultiplier tubes. Each tube was placed in the beam head on so that all parts were exposed and side on so that only the electron multiplier was irradiated. GRA

N84-33720# Naval Postgraduate School, Monterey, Calif.
COOLING OF HIGH POWER GENERATORS AND MOTORS FOR ELECTRIC PROPULSION M.S. Thesis
James LeRoy Szatkowski Mar. 1984 136 p
(AD-A144049) Avail: NTIS HC A07/MF A01 CSCL 13/10

This study reviews the history and development of marine electric propulsion drives, the types of electric propulsion, and the inherent losses which occur within the synchronous ac machines typically used for high-power propulsion systems. A thorough review of the literature pertaining to heat transfer in electrical machinery is made. In particular, the use of liquid cooling in various flow configurations, including buoyancy-driven thermosyphons and two-phase thermosyphons is analyzed. Forced-liquid cooling is feasible, but the required rotating seals are a problem in reliability. Closed-loop thermosyphon cooling appears feasible at high rotational speeds, although a secondary heat exchange through the shaft is required. Closed, two-phase thermosyphons and heat pipes are also feasible, but require forced-air circulation for heat rejection to the ambient. Since all of these concepts deserve additional attention, areas for further research and development are recommended. Author (GRA)

N84-33721# Rose-Hulman Inst. of Tech., Terre Haute, Ind.
GALLIUM ARSENIDE FIELD-EFFECT TRANSISTOR MAGNETIC FIELD STUDIES Final Report, 1 May 1983 - 30 Apr. 1984
M. J. Moloney 22 Jun. 1984 13 p
(Grant AF-AFOSR-0133-83)
(AD-A144058; AFOSR-84-0625TR) Avail: NTIS HC A02/MF A01 CSCL 09/1

This Minigrant work followed the author's effort in the 1982 Summer Faculty Research Program at WPAFB developing a prototype GaAs FET computer model. During the Minigrant work, the computer model was developed, tested and run extensively. Development included using true GaAs velocity overshoot correctly in the model, greatly increasing model speed, evolving an improved way to handle carrier transport, studying conduction through the semi-insulating substrate, handling individual cell doping and mobility, testing the model for valid capacitance calculations, testing the model for Gunn oscillations in a diode configuration (and obtaining good results), and use of rectangular cells rather than the original square ones. Author (GRA)

N84-33722# Department of the Air Force, Washington, D.C.
FEED DISPLACEMENT CORRECTION IN A SPACE FED LENS ANTENNA Patent Application
R. L. Haupt, inventor (to Air Force) Filed 2 May 1984 24 p
(AD-D011155; US-Patent-Appl-SN-616325) Avail: NTIS HC A02/MF A01 CSCL 09/5

A space fed microwave lens antenna for deployment in outer space or other remote, hazardous or unattended location is described. Electronic means are provided for compensating for errors in the mechanical displacement of the phased array feed elements from the phased array lens elements. Author (GRA)

N84-33723# Department of the Air Force, Washington, D.C.
MULTILAYER CERAMIC CAPACITOR Patent Application
R. D. Larowe, inventor (to Air Force) Filed 6 Jun. 1984 15 p
(AD-D011166; US-Patent-Appl-SN-617666) Avail: NTIS HC A02/MF A01 CSCL 09/1

The multilayer capacitor has the plates arranged vertically, which allows planar attachment with conductive epoxy to a substrate such as thick film conductor on alumina. The top termination may use wire bonding. The capacitor has the same form factor and size as prior capacitors of the same electrical ratings. GRA

N84-33724# Department of the Air Force, Washington, D.C.
TRIGGERED SPARK GAP DISCHARGER Patent Application
R. E. Wootton, inventor (to Air Force) Filed 5 Jun. 1984 12 p
(AD-D011174; US-Patent-Appl-SN-617449) Avail: NTIS HC A02/MF A01 CSCL 09/1

The present invention relates to spark gap devices and particularly to a triggered spark gap discharger of improved design operation. A need exists for devices capable of rapidly switching or discharging high currents with a relative low voltage drop

there across. Transistors and vacuum tubes are capable of handling currents of a few amperes. Cold cathode trigger tubes and thyratrons are useful in switching several hundred amperes. At higher voltages and currents of a few thousand amperes, ignitrons are required. For very high operating voltages and currents, triggered spark gaps come into use. GRA

N84-33725*# Gould, Inc., Rolling Meadows, Ill. Electronics Lab.

A BATTERY CHARGER AND STATE OF CHARGE INDICATOR Final Report

Thomas S. Latos 15 Apr. 1984 252 p refs

(Contracts JPL-955782; DE-AI01-78CS-54209)

(NASA-CR-173961; NAS 1.26:173961; DE84-014614; DOE/CS-54209/16) Avail: NTIS HC A12/MF A01 CSCL 09A

A battery charger which has a full wave rectifier in series with a transformer isolated 20 kHz dc-dc converter with high frequency switches, which are programmed to actively shape the input dc line current to be a mirror image of the ac line voltage is discussed. The power circuit operates at 2 kW peak and 1 kW average power. The BC/SCI has two major subsystems: (1) the battery charger power electronics with its controls; and (2) a microcomputer subsystem which is used to acquire battery terminal data and exercise the state of charge software programs. The state of charge definition employed is the energy remaining in the battery when extracted at a 10 kW rate divided by the energy capacity of a fully charged new battery. The battery charger circuit is an isolated boost converter operating at an internal frequency of 20 kHz. The switches selected for the battery charger are the single most important item in determining its efficiency. The combination of voltage and current requirements dictate the use of high power NPN Darlington switching transistors. The power circuit topology is a three switch design which utilizes a power FET on the center tap of the isolation transformer and the power Darlingtons on each of the two ends. An analog control system is employed to accomplish active input current waveshaping as well as the necessary regulation. DOE

N84-33726# Department of Energy, Washington, D. C.

LOW FREQUENCY ac WAVEFORM GENERATOR Patent Application

Oscar W. Bilharz, inventor (to DOE) Filed 22 Nov. 1983 20 p

(Contract DE-AC12-76SN-00052)

(DE84-014310; US-Patent-Appl-SN-554413) Avail: NTIS HC A02/MF A01

Low frequency sine, cosine, triangle and square waves are synthesized in circuitry which allows variation in the waveform amplitude and frequency while exhibiting good stability and without requiring significant stabilization time. A triangle waveform is formed by a ramped integration process controlled by a saturation amplifier circuit which produces the necessary hysteresis for the triangle waveform. The output of the saturation circuit is tapped to produce the square waveform. The sine waveform is synthesized by taking the absolute value of the triangular waveform, raising this absolute value to a predetermined power, multiplying the raised absolute value of the triangle wave with the triangle wave itself and properly scaling the resultant waveform and subtracting it from the triangular waveform to a predetermined power and adding the squared waveform raised to the predetermined power with a dc reference and subtracting the squared waveform therefrom, with all waveforms properly scaled. The resultant waveform is then multiplied with a square wave in order to correct the polarity and produce the resultant cosine waveform. DOE

N84-33727# Department of Energy, Washington, D. C.

METHOD OF FABRICATING A MONOLITHIC CORE FOR A SOLID OXIDE FUEL CELL Patent Application

Stanley A. Zwick and John P. Ackerman, inventors (to DOE) Filed 12 Oct. 1983 30 p

(Contract W-31-109-eng-38)

(DE84-014665; US-Patent-Appl-SN-541184) Avail: NTIS HC A03/MF A01

A method is disclosed for forming a core for use in a solid oxide fuel cell that electrochemically combines fuel and oxidant for generating galvanic output. The core has an array of electrolyte and interconnect walls that are substantially devoid of any composite inert materials for support consisting instead only of the active anode, cathode, electrolyte and interconnect materials. Each electrolyte wall consists of cathode and anode materials sandwiching electrolyte material therebetween, and each interconnect wall consists of the cathode and anode materials sandwiching interconnect material therebetween. The method consists of building up the electrolyte and interconnect walls by depositing each material on individually and endwise of the wall itself, where each material deposit is sequentially applied for one cycle; and where the depositing cycle is repeated many times until the material buildup is sufficient to formulate the core. The core is heat cured to become dimensionally and structurally stable. DOE

N84-33728# Department of Energy, Washington, D. C.

SOLID OXIDE FUEL CELL HAVING MONOLITHIC CORE Patent Application

John P. Ackerman and John E. Young, inventors (to DOE) Filed 12 Oct. 1983 31 p

(Contract W-31-109-eng-38)

(DE84-014659; US-Patent-Appl-SN-541213) Avail: NTIS HC A03/MF A01

A solid oxide fuel cell is described for electrochemically combining fuel and oxidant for generating galvanic output, wherein the cell core has an array of electrolyte and interconnect walls that are substantially devoid of any composite inert materials for support. The core is monolithic, where each electrolyte wall consists of thin layers of cathode and anode materials sandwiching a thin layer of electrolyte material. The electrolyte walls are arranged and backfolded between adjacent interconnect walls operable to define a plurality of core passageways alternately arranged where the inside faces have only the anode material or only the cathode material exposed. Each layer of the electrolyte and interconnect materials 0.002 to 0.01 cm thick; and each layer of the cathode and anode materials is 0.002 to 0.05 cm thick. DOE

N84-33729# Department of Energy, Washington, D. C.

FUEL CELL STACK WITH INTERNAL MANIFOLDS FOR REACTANT GASES Patent Application

Arthur W. Schnacke, inventor (to DOE) Filed 12 Oct. 1983 20 p

(Contract DE-AC02-80ET-17019)

(DE84-014662; US-Patent-Appl-SN-541185) Avail: NTIS HC A02/MF A01

A fuel cell stack includes a plurality of plate like fuel cells arranged along an axis generally parallel to cell thickness with electrically conductive separator plates between each pair of cells. A plurality of axial manifolds are provided at opposite sides of the stack in outer marginal portions beyond the edges of electrodes and electrolyte tiles. Sealing rings prevent cross leakage of oxidant fuel gases through use of pairs of outwardly extending lips from opposite tile surfaces bonded to first and second electrode frames respectively. The frames provide transition between electrode edges and manifold perimeters. The pairs of extension lips are sealingly bonded together through an electrically insulative sealing ring with wedge shaped fastening members. DOE

N84-33730# Department of Energy, Washington, D. C.

SOLID OXIDE FUEL CELL HAVING COMPOUND CROSS FLOW GAS PATTERNS Patent Application

Anthony V. Fraioli, inventor (to DOE) Filed 12 Oct. 1983 28 p

(Contract W-31-109-eng-38)

(DE84-014666; US-Patent-Appl-SN-541176) Avail: NTIS HC A03/MF A01

A core construction for a fuel cell is disclosed having both parallel and cross flow passageways for the fuel and the oxidant gases. Each core passageway is defined by electrolyte and interconnect walls. Each electrolyte wall consists of cathode and anode materials sandwiching an electrolyte material. Each interconnect wall is formed as a sheet of inert support material having spaced small plugs of interconnect material, where cathode and

anode materials are formed as layers on opposite sides of each sheet and are electrically connected together by the interconnect material plugs. Alternate tiers are arranged to have the passageways disposed normal to one another. Solid mechanical connection of the interconnect walls of adjacent tiers to the opposite sides of the common electrolyte wall is only at spaced contact areas, where the contact areas cross one another. DOE

N84-33731# Department of Energy, Washington, D. C.
INTEGRAL MANIFOLDING STRUCTURE FOR FUEL CELL CORE HAVING PARALLEL GAS FLOW Patent Application
Joseph E. Herceg, inventor (to DOE) Filed 12 Oct. 1983 31 p
(Contract W-31-109-eng-38)
(DE84-014864; US-Patent-Appl-SN-541178) Avail: NTIS HC A03/MF A01

Manifolding means for directing the fuel and oxidant gases to parallel flow passageways in a fuel cell core are disclosed. Each core passageway is defined by electrolyte and interconnect walls. Each electrolyte and interconnect wall consists respectively of anode and cathode materials layered on the opposite sides of electrolyte material, or on the opposite sides of interconnect material. A core wall projects beyond the open ends of the defined core passageways and is disposed approximately midway between and parallel to the adjacent overlaying and underlying interconnect walls to define manifold chambers on opposite sides of the wall. Each electrolyte wall defining the flow passageways is shaped to blend into and be connected to this wall in order to redirect the corresponding fuel and oxidant passageways to the respective manifold chambers either above or below this intermediate wall. Inlet and outlet connections are made to these separate manifold chambers respectively, for carrying the fuel and oxidant gases to the core, and for carrying their reaction products away from the core. DOE

N84-33732# Department of Energy, Washington, D. C.
ELECTRO-OPTICAL SWITCHING AND MEMORY DISPLAY DEVICE Patent Application
Terje A. Skotheim, William E. OGrady, and Clovis A. Linkous, inventors (to DOE) Filed 29 Dec. 1983 24 p
(DE84-014227; US-Patent-Appl-SN-566757) Avail: NTIS HC A02/MF A01

An electro-optical display device is described having a housing including one transparent wall and at least one other wall. Counter electrodes are positioned on the transparent wall and display electrodes are positioned on the other wall with both electrodes in electrically conductive relationship with an electrolyte. Circuits means are connected to the display and counter electrodes to apply different predetermined control potentials between them. The display electrodes are covered with a thin electrically conductive polymer film that is characterized according to the invention by having embedded in it pigment molecules as counter ions. The display device is operable to be switched to a plurality of different visual color states at an exceptionally rapid switching rate while each of the color states is characterized by possessing good color intensity and definition. DOE

N84-33733*# Eagle-Picher Industries, Inc., Joplin, Mo. Couples Dept.
NICKEL-IRON BATTERY SYSTEM SAFETY Final Report
R. C. Saltat Jun. 1984 66 p refs
(Contract DE-AI01-78CS-54209)
(NASA-CR-173962; JPL-9950-910; NAS 1.26:173962; DE84-014598; DOE/CS-54209/19) Avail: NTIS HC A04/MF A01 CSCL 10C

Eagle-Picher Industries conducted a literature search and experimental tests to characterize the generated flow rates of gaseous hydrogen (GH2) and gaseous oxygen (GO2) from an electrical vehicle (EV) nickel iron battery system. The resulting gassing rates were used to experimentally evaluate the flame quenching capabilities of several candidate devices to prevent the propagation of flame within batteries having central watering/venting systems. The battery generated hydrogen (GH2) and oxygen (GO2) gasses were measured for a complete charge and discharge cycle. The data correlates well with accepted theory during strong overcharge conditions indicating that the measurements are valid for other portions of the cycle. Tests have confirmed that the gas mixture in the cells is always flammable regardless of the battery status. Research of flame arrestor literature yielded little information regarding their operation with hydrogen-oxygen mixtures. It was indicated that a conventional flame arrestor would not be effective over the broad spectrum of gassing conditions presented by a nickel iron battery. DOE

N84-33734# Battelle Columbus Labs., Ohio.
PROJECT SUMMARIES, SUPPLEMENT
Jun. 1984 115 p Presented at the 6th DOE Electrochem. Contractor's Rev. Conf., Washington, D.C., 25-29 Jun. 1984 Prepared in cooperation with Pacific Northwest Lab.
(Contract DE-AC06-76RL-01830)
(DE84-013678; CONF-840677-Suppl) Avail: NTIS HC A06/MF A01

A compilation of project summaries of research supported by the electrochemical storage program from January 1983 through June 1984 is presented. It is a technical overview for engineers and scientists in government, industry and academia who are interested in finding out more about this program. Research reviewed includes sodium sulfur battery, battery performance and testing, battery analysis, flow batteries, lithium rechargeable batteries, alkaline batteries, metal air batteries, fuel cells and electrochemical processes. DOE

N84-33735# Research Inst. of National Defence, Linkoeping (Sweden). Dept. 3.
TRANSIENT CIRCUIT OVERVOLTAGES IN SWEDISH MANUFACTURING INDUSTRY
Haakan Wernstroem, Maths Broems, and Stig Boberg Apr. 1984 49 p refs In SWEDISH; ENGLISH summary
(FOA-E-30002-E26) Avail: NTIS HC A03/MF A01; Research Institute of National Defence, Stockholm KR 50

Transient overvoltages were surveyed on the 220/380V power supply systems, because mains-borne disturbances can affect solid state circuitry and cause hazards to persons working at machines with electronic control systems. Transients were registered during 70 months, and extremum voltages between 2000 and 2500 V were recorded. A considerable number of transients with peaks in the range from 1000 to 1200 V were also observed. The wave shapes show rise times down to 20 nsec, which was the limit of the measuring instrument, and durations from 0.2 microsec extending over several microsec. Most transients have oscillations with frequencies in the 300 kHz to 1.6 MHz range. Author (ESA)

N84-33736# Research Inst. of National Defence, Linkoeping (Sweden). Dept. 3.
EFFECTS OF TRANSIENT IONIZING RADIATION IN VARIOUS GENERATIONS OF TTL-CIRCUITS IN THE 54/74 SERIES
Gunnar Goeransson Mar. 1984 82 p refs In SWEDISH; ENGLISH summary
(FOA-C-30365-A3; ISSN-0347-3708) Avail: NTIS HC A05/MF A01; Research Institute of National Defence, Stockholm KR 50

Radiation effects from transient ionizing radiation in integrated TTL circuits was studied, to find out effects of ionizing initial radiation from nuclear weapon explosions. Radiation susceptibility of standard Schottky and low power Schottky TTL is discussed. Author (ESA)

N84-33737# Kraftwerk Union A.G., Mulheim (West Germany).
SUPERCONDUCTING AC GENERATORS Final Report, Dec. 1982
Dietrich Lambrecht and Guenther Bogner (Siemens AG, Erlangen, West Germany) Bonn Bundesministerium fuer Forschung und Technologie Jun. 1984 525 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-102; ISSN-0340-7608) Avail: NTIS HC A22/MF A01; Fachinformationszentrum, Karlsruhe, West

Germany DM 69

Investigations into the development of superconducting generators are presented. Theoretical and experimental aspects of basic investigations, design and construction, technological and manufacturing developments, and functional tests on models are discussed. Information on the joint KWU/Siemens long term development program, the status of corresponding development work in other countries, and the special features of superconducting generators are given. Author (ESA)

N84-33629# Joint Publications Research Service, Arlington, Va.
CEMA COOPERATION IN MICROELECTRONICS RESEARCH, PRODUCTION
In its East Europe Rept.: Sci. Affairs (JPRS-ESA-84-007) 5 Mar. 1984 p 1-2 Transl. into ENGLISH from Radio Fernsehen Electron. (East Berlin), no. 1, 1984 p 4 (For primary document see N84-33628 23-31)
Avail: NTIS HC A03/MF A01

N84-33630# Joint Publications Research Service, Arlington, Va.
SOVIET INTEGRATED CIRCUITS IN USE IN GDR
Wilfried Loeffler *In its* East Europe Rept.: Sci. Affairs (JPRS-ESA-84-007) 5 Mar. 1984 p 3-8 refs Transl. into ENGLISH from Radio Fernsehen Electron. (East Berlin), no. 11, 1983 p 690-691 (For primary document see N84-33628 23-31)
Avail: NTIS HC A03/MF A01

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

N84-33738 Polish Academy of Sciences, Warsaw.
EXISTENCE AND EQUIVALENCE OF SOLUTIONS OF MIXED PROBLEMS FOR EULER'S HYDRODYNAMIC EQUATIONS [ISTNIENIF I JEDNOZNACZNOSC ROZWIAZAN PROBLEMOW MIESZANYCH DLA HYDRODYNAMICZNYCH ROWNAN EULERA]
W. Zajaczkowai 1983 26 p refs In POLISH
(ISSN-0208-5658) Copyright. Avail: Issuing Activity

Zajaczkowski's thesis on the solvability of the leakage problem for the nonstationary Euler equations in Sobolev spaces is summarized. Mixed problems for Euler's equations are analyzed. The fundamental problem of hydrodynamics is reviewed, and the issues of flow of an ideal fluid are examined. Mathematical bases of fluid mechanics are formulated. Hypotheses concerning the existence, equivalence, and regularity of solutions of the Dirichlet problem are discused, among others. The Holder spaces, Miranda-Agmon maximum principle for solutions of elliptic boundary value problems in domains with singular points on the boundary, Green's functions, and the Schauders estimates for solutions of elliptic boundary value problems involving a dihedral angle are discussed. Author

N84-33739 California Univ., Berkeley.
UNSTEADY HEAT TRANSFER DURING THE INTERACTION OF A LAMINAR FLAME WITH A COLD WALL Ph.D. Thesis
Steven Ray Vosen 1983 173 p
Avail: Univ. Microfilms Order No. DA8413621

Measurements were made of the unsteady heat transfer to a wall during the quenching of premixed, methane-air flames. One dimensional laminar flames were produced in a constant volume chamber and the heat transfer was measured into the quenching surface by means of a platinum thin film resistance thermometer. The experiments were performed over a range of pressures varying from 1 to 4 atmospheres and over a range of equivalence ratios from 0.7 to 1.2. Possible catalytic effects of the gauge were appraised by comparing the heat flux as obtained from different types of gauges. The experimental results were compared to the predictions of three numerical models. Two of the models were finite difference formulation of the conservation equations: one with detailed kinetics and the other with one step kinetics. The third model was an integral method with ignition temperature kinetics. Dissert. Abstr.

N84-33740 California Univ., Berkeley.
LAMINAR CONVECTION WITH BUOYANCY IN TUBE FLOWS WITH A SURROUNDING LIQUID MEDIUM Ph.D. Thesis
Jean-Pascal Coutier 1983 133 p
Avail: Univ. Microfilms Order No. DA8413352

The laminar flow and heat transfer within a horizontal tube surrounded by a liquid medium are studied both numerically and experimentally. Emphasis is given to flow regimes where a buoyant effect on the forced flow is exhibited within the tube. Two different boundary conditions are investigated. When the surrounding liquid dictates its temperature to the wall, the boundary is assumed to be isothermal (boundary condition of the first kind). When the outside liquid is not constantly replaced, natural convection occurs around the tube wall, creating a temperature gradient along the surface of the tube. A large-scale experimental facility is constructed and approximately 100 tests are carried out over a wide range of operating conditions. The secondary flow effects are verified qualitatively by direct visualization of the flow, using a dye-injection method. A three-dimensional numerical model is used to analyze the flow behavior and the heat transfer in a short horizontal tube. Both experimental and theoretical results demonstrate that the flow is complex and three dimensional. Dissert. Abstr.

N84-33741 Stanford Univ., Calif.
FILM COOLING ON A CONVEX WALL: HEAT TRANSFER AND HYDRODYNAMIC MEASUREMENTS FOR FULL AND PARTIAL COVERAGE Ph.D. Thesis
Kokichi Furuhama 1984 177 p
Avail: Univ. Microfilms Order No. DA8412844

Discrete-hole injection is widely used for turbine-blade cooling in high-efficiency turbine engines. Detailed measurements of the spanwise-averaged heat transfer and the local hydrodynamics of a film-cooled flow on a convex wall, for both full and partial coverage are reported. Hydrodynamic boundary-layer profiles were measured with a triple hot-wire probe. Three mean-velocity components and six turbulence quantities were simultaneously measured; inside the blown region strong three-dimensionality was observed. The flow field seems divided into two types of lanes: those with injection holes and lanes without. The flow in lanes with holes was strongly affected by injection, but in the lane without holes only small effects were observed. A prediction program, STAN-FC-CRV (combining STANCOOL and STANCURV), was tested for four representative cases. Comparison of predictions with experimental data shows reasonable agreement, but further modification is necessary for the injection model. Dissert. Abstr.

N84-33742 Akron Univ., Ohio.
COMPUTATIONAL MODELLING OF JET INDUCED MIXING IN CRYOGENIC PROPELLANT TANKS IN LOW-G Ph.D. Thesis
John I. Hochstein 1984 360 p
Avail: Univ. Microfilms Order No. DA8414644

The SOLA-ECLIPSE Code is developed to enable computational prediction of jet induced mixing in cryogenic propellant tanks in a low gravity environment. The code is an out growth of the SOLA family of codes and it solves the incompressible Navier-Stokes equations in conjunction with the thermal energy equation and a k epsilon turbulence model. The code performance is verified by comparing code predictions to existing data from small scale zero-g experiments. The code predictions are found to be in good agreement with the data. Dissert. Abstr.

N84-33743 Illinois Univ., Chicago.
EFFECT OF WEISSENBERG NUMBER ON TURBULENT HEAT TRANSFER AND FRICTION FACTOR OF VISCOELASTIC FLUIDS Ph.D. Thesis
Eug-Yun Kwack 1983 225 p

Avail: Univ. Microfilms Order No. DA8403364

The effect of the elasticity of viscoelastic fluids on heat transfer and drag reduction behavior was investigated with aqueous polyacrylamide solutions flowing turbulently in circular pipes. A new dimensionless number called the Weissenberg number was used to account for the elasticity of the fluid. It was found that the fully established friction factor and dimensionless heat transfer coefficient, decrease with increasing Weissenberg number for a fixed Reynolds number up to certain critical Weissenberg numbers for friction and for heat transfer which are 5 to 10 and 200 to 250 respectively. The Powell-Eyring model was used to calculate the characteristic time of each test fluid for determining the Weissenberg number. The influence of polymer concentration, fluid degradation, pipe diameter and solvent chemistry on the behavior of friction and heat transfer of viscoelastic fluids was found to be adequately accounted for in the Weissenberg and Reynolds numbers. Dissert. Abstr.

N84-33744 Mississippi State Univ., State College.
A DISCRETE ELEMENT PREDICTION APPROACH FOR TURBULENT FLOW OVER ROUGH SURFACES Ph.D. Thesis
Robert Pendleton Taylor 1983 139 p
Avail: Univ. Microfilms Order No. DA8413962

A discrete element model for turbulent flow over rough surfaces was rigorously derived from basic principles. This model includes surface roughness effects as a constituent part of the partial differential equations which describe momentum and energy transport in turbulent flows. The model includes the necessary empirical information on the interaction between the roughness elements and the flow around and between the elements in a general way which does not require experimental data on each specific surface. This empirical information is input via algebraic models for the local element drag coefficient and Nusselt number. These models are calibrated by comparison with base data sets from surfaces with three-dimensional (distributed) roughness elements. Dissert. Abstr.

N84-33745 Stanford Univ., Calif.
A FAST ACCURATE ALGORITHM FOR SOLVING THE STEADY 3-DIMENSIONAL EQUATIONS FOR INVISCID ROTATIONAL FLOW Ph.D. Thesis
Muriel Yukiko Ishikawa 1984 132 p
Avail: Univ. Microfilms Order No. DA8412855

The development of a method is in which the set of three-dimensional Euler equations in nonconservative form is perturbed about an arbitrary reference state (in this case, the free-stream state). The resultant perturbed linear left-hand side and non-linear right-hand side terms of the equations are solved by a successive approximation procedure. A computer code is developed and extensively tested. Calculations show the algorithm to be an order of magnitude faster than other Euler schemes; demonstrate the accuracy of the algorithm; produce symmetric solutions for symmetric problems; and show negligible dissipative effects. Dissert. Abstr.

N84-33746 Stanford Univ., Calif.
A NONSTATIONARY RELAXATION TECHNIQUE FOR SOLVING THE EQUATIONS OF GAS DYNAMICS Ph.D. Thesis
Yen Liu 1984 124 p
Avail: Univ. Microfilms Order No. DA8412867

A nonstationary relaxation technique specially designed for solving the steady-state equations of gas dynamics is investigated. The approach adopts a form of Newton's method for the solution process. All the nonlinear terms are linearized based on a reference state function which is a assumed state of the dependent variables. Each linear system based about that reference state functions is cast into finite difference form by using central differencing and Dirichlet boundary conditions over the entire mesh. The resulting difference equations solved by a fast nonstationary relaxation scheme. The process is repeated until a convergent criterion is satisfied. Results differencing method when properly interpreted and applied is an efficient way to find time-invariant solutions to the Cauchy-Riemann and Euler equations. Dissert. Abstr.

N84-33747 Minnesota Univ., Minneapolis.
HEAT TRANSFER FROM A CIRCULAR CYLINDER DUE TO A SLOT JET IMPINGEMENT Ph.D. Thesis
Adman Abdul-Rahman Alhomoud 1984 195 p
Avail: Univ. Microfilms Order No. DA8413748

Mass transfer coefficients and fluid flow patterns were determined experimentally for a circular cylinder situated in a crossflow of an impinging slot jet. The effect of offset whereby the cylinder axis is displaced from the symmetry plane of the jet was examined. The effects of the jet generating nozzle width, the cylinder to nozzle separation distance, the offset distance, and the Reynolds number are investigated. Numerical solutions are obtained for a laminar jet. A set of low Reynolds number experiments was performed to compare with the numerical results. Flow visualization experiments show that the jet impinges on the cylinder even when it is in the offset positions, and that the impingement angle increases with increasing Reynolds number and with increasing offset, but decreases with increasing cylinder to nozzle separation distance. Results indicate that the Sherwood number decreases with increasing offset and with increasing the cylinder to nozzle separation distance, but it increases, at a given Reynolds number, with increasing the nozzle width. Dissert. Abstr.

N84-33748*# National Aeronautics and Space Administration, Washington, D. C.
VISUALIZATION OF THE 3-DIMENSIONAL FLOW AROUND A MODEL WITH THE AID OF A LASER KNIFE
V. Ya. Borovoy, V. V. Ivanov, A. A. Orlov, and V. N. Kharchenko Jul. 1984 14 p refs Transl. into ENGLISH from Uch. Zap. TsAGI (USSR), v. 4, no. 5, 1973 p 42-49 Original language doc. was announced as A75-28656 Transl. by Scientific Translation Services, Santa Barbara, Calif.
(NASA-TM-77497; NAS 1.15:77497) Avail: NTIS HC A02/MF A01 CSCL 20D

A method for visualizing the three-dimensional flow around models of various shapes in a wind tunnel at a Mach number of 5 is described. A laser provides a planar light flux such that any plane through the model can be selectively illuminated. The shape of shock waves and separation regions is then determined by the intensity of light scattered by soot particles in the flow. Author

N84-33749*# Computational Mechanics Consultants, Knoxville, Tenn.
THE CMC/3DPNS COMPUTER PROGRAM FOR PREDICTION OF THREE-DIMENSION, SUBSONIC, TURBULENT AERODYNAMIC JUNCTURE REGION FLOW. VOLUME 2: USERS' MANUAL
P. D. Manhardt Sep. 1982 66 p
(Contract NAS1-15105)
(NASA-CR-165997; NAS 1.26:165997; CMC/82TR-2.2-Vol-2) Avail: NTIS HC A04/MF A01 CSCL 20D

The CMC fluid mechanics program system was developed to transmit the theoretical solution of finite element numerical solution methodology, applied to nonlinear field problems into a versatile computer code for comprehensive flow field analysis. Data procedures for the CMC 3 dimensional Parabolic Navier-Stokes (PNS) algorithm are presented. General data procedures a juncture corner flow standard test case data deck is described. A listing of the data deck and an explanation of grid generation methodology are presented. Tabulations of all commands and variables available to the user are described. These are in alphabetical order with cross reference numbers which refer to storage addresses. E.A.K.

N84-33750# McDonnell-Douglas Research Labs., St. Louis, Mo.
CONTROL OF JET FLOWFIELD DYNAMICS Annual Technical Report, 1 Jan. 1983 - 1 Jan. 1984
V. Kibens and R. W. Wlezien 29 Feb. 1984 46 p
(Contract F49620-83-C-0048)
(AD-A143631; MDC-Q1214; AFOSR-84-0551TR) Avail: NTIS HC A03/MF A01 CSCL 20/4

Passive control of shear layer turbulence was investigated experimentally for low subsonic velocity jets from circular nozzles by studying effects of modifying nozzle exit geometry. Indeterminate

origin (I.O.) nozzles used, including slanted, stepped and crenelated exit geometries, were so designated because streamwise location of the nozzle lip varies with azimuthal position, unlike standard nozzles for which the entire termination is at the same streamwise location. Flow visualization and detailed hot-wire measurements were used to observe development and interaction of large-scale turbulent structures in shear layers originating from various sectors of the I.O. nozzles, to determine the influence of instability wave patterns on ensuing flowfield characteristics and to relate observed evolution of three-dimensional large-scale turbulent structures to global properties of the jet flowfield such as velocity profiles and shear layer spreading rates as a function of streamwise distance and azimuthal angle. Results showed pronounced asymmetries in shear layer growth rates, which could be controlled by varying nozzle parameters. The asymmetries were also confirmed by measurements of azimuthal variation of shear layer turbulent energy as well as mean-velocity profiles. Detailed features of energy transfer from the mean flow into successively larger flow structures were traced by spectral mapping techniques and by mapping energy levels contained in subharmonics of the shear-layer instability frequency at various azimuthal flow sectors. GRA

N84-33751# California Inst. of Tech., Pasadena. Aeronautical Labs.
LARGE STRUCTURE IN THE FAR WAKES OF TWO-DIMENSIONAL BLUFF BODIES
J. M. Cimbala 1984 138 p
(Contract N00014-76-C-0260)
(AD-A143642) Avail: NTIS HC A07/MF A01 CSCL 20/4

Smoke-wire flow visualization and hot-wire anemometry have been used to study near and far wakes of two-dimensional bluff bodies. For the case of a circular cylinder at $70 < Re < 2000$, a very rapid (exponential) decay of velocity fluctuations at the Karman vortex street frequency is observed. Beyond this region of decay, large-scale (lower wave-number) structure can be seen. In the far wake (beyond one hundred diameters) a broad band of frequencies is selectively amplified and then damped, the center of the band shifting to lower frequencies as downstream distance is increased. The far-wake structure does not depend directly on the scale or frequency of the original Karman vortices; the growth of this structure is due to hydrodynamic instability of the developing mean wake profile; it is not caused by amalgamation of the Karman vortices. Hot-wire measurements show that two-dimensional locally-parallel inviscid linear stability theory is adequate to explain the growth of downstream structure. Namely, measured prominent frequencies in the cylinder wake are in close agreement with those predicted by the theory, when streamwise growth of wake width is taken into account. GRA

N84-33752# Ballistic Research Labs., Aberdeen Proving Ground, Md.
CONTRIBUTION OF PRESSURE TO THE MOMENT DURING SPIN-UP ON A NUTATING LIQUID-FILLED CYLINDER: AD HOC MODEL Final Report
Nathan Gerber Jun. 1984 55 p
(DA Proj. 1L1-61102-AH-43)
(AD-A143678; AD-F300436; ARBRL-TR-02563) Avail: NTIS HC A04/MF A01 CSCL 19/1

A study is made of the flow of a liquid in a cylindrical container that nutiates at constant frequency and small amplitude and impulsively begins spinning with a fixed angular velocity. In particular, the history of pressure overturning moment during spin-up is investigated. The partial differential equations of the problem are linearized, and a modal analysis (separated variable solution) is applied. One consequence of stipulating a modal analysis is a difficulty with endwall boundary conditions; this difficulty is avoided here by specifying a heuristic boundary condition and then satisfying it approximately. Calculations indicate that peaks of overturning or restoring moment occur at or near those times when the nutational frequency is equal to one of the frequencies of inertial oscillations of the liquid. This phenomenon of resonance extends the result of Stewartson obtained for inviscid perturbations in solid body rotation. GRA

N84-33753# Florida Univ., Gainesville.
A FLOW VISUALIZATION INVESTIGATION ON SELECTED SHAPES WITH EMPHASIS ON FLOW SEPARATION Final Report, Jul. 1981 - Sep. 1982
M. H. Clarkson Dec. 1983 34 p
(Contract F08635-81-K-0281)
(AD-A143804; AFATL-TR-83-94) Avail: NTIS HC A03/MF A01 CSCL 20/4

Four bodies having square sections were tested in the University of Florida water tunnel using the method of continuous distribution of dye sources combined with a tracer dye element. Representative photographs are presented along with a topological interpretation of the flow visualization in crossflow planes. The techniques are described in detail. GRA

N84-33754# Imperial Coll. of Science and Technology, London (England).
BURSTS AND PRESSURE FLUCTUATIONS IN TURBULENT BOUNDARY LAYERS Final Technical Report
P. Bradshaw and J. F. Morrison Apr. 1983 65 p
(Contract DAJA37-81-C-0162; DA Proj. IT1-61102-BH-57)
(AD-A143811) Avail: NTIS HC A04/MF A01 CSCL 20/4

Development of measurement techniques and acquisition of velocity- and pressure- fluctuation data in low-speed turbulent boundary layers are described. The object was to study the generation of pressure fluctuations by the turbulent eddies and to use the surface pressure fluctuation as a diagnostic tools, thus bringing together new and existing knowledge of the behavior of the outer layer large eddies, the inner layer and viscous sublayer, and the surface pressure fluctuations themselves. Data analysis is still in progress. GRA

N84-33755# Maschinenfabrik Augsburg-Nuernberg A.G., Munich (West Germany).
M.A.N. HEAT PUMPS IN INDUSTRY AND COMMUNITIES, AND THEIR EFFICIENCY [M. A. N. -WAERMEPUMPEN IN INDUSTRIE UND KOMMUNEN UND IHRE WIRTSCHAFTLICHKEIT]
Gert Griesbach 1984 22 p In GERMAN Presented at Rahmen der Fachshau Energie auf der Hannover Messe 1984
Avail: NTIS HC A02/MF A01

Heat pumps for refrigeration and heating are described. A gas motor heat pump is used. Large quantities of heat from the cooling water are available for the fabrication of capacitors. Buildings and industry halls are heated with the heat pump with an asynchronous motor/generator. This tandem system allows several combinations for energy supply. The energy concept consists of five, microprocessor controlled, functional units which can be used independently. Installation costs are recouped in 3 yr. The heating system of a school where a gas motor heat pump is combined with a natural gas fired boiler is also described. Division into a high and a low temperature system guarantees efficient operation. Energy saving of 58% compared to a boiler system is obtained. In the heating system of a hospital where a gas motor heat pump is combined with the existing boiler system, energy saving of 50% compared to the previous system is obtained.
Author (ESA)

N84-33756# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Inst. fuer Theoretische Stroemungsmechanik.
OSCILLATORY CONVECTION Ph.D. Thesis - Karlsruhe Univ.
Roland Kessler Feb. 1984 95 p refs In GERMAN; ENGLISH summary
(DFVLR-FB-84-14) Avail: NTIS HC A05/MF A01; DFVLR, Cologne DM 29

The steady and oscillatory convection in a rectangular box heated from below is studied theoretically. The spatial structure of the three-dimensional flow, caused by the vertical boundaries of the box, is influenced by the Prandtl number and the thermal boundary conditions of the side walls. The three-dimensional effects of the convection flow are discussed using the calculated steady flows. The onset and the frequency of the oscillatory instability is determined by solving the nonlinear, time-dependent equations.

The numerical solutions show that the cause of the instability strongly depends on the Prandtl number. A Galerkin method for the solution of the three-dimensional, time dependent Navier-Stokes equations is presented. Author (ESA)

N84-33757# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
SPECIAL COURSE ON STABILITY AND TRANSITION OF LAMINAR FLOW
Loughton, England Jun. 1984 227 p refs Course held in Rhode-Saint-Genese, Belgium, 26-30 Mar. 1984; sponsored by AGARD and the Von Karman Inst. of Fluid Dynamics
(AGARD-R-709; ISBN-92-835-0355-4) Avail: NTIS HC A13/MF A01

Stability and transition of laminar flows to understand laminar turbulent transition was studied. Incompressible two dimensional and compressible flows in transonic, supersonic, and hypersonic regimes and available results for three dimensional flows were discussed. Material presented and discussed at the Special Course held at the von Karman Institute, Belgium sponsored by the Institute and the AGARD fluid dynamics panel. For individual titles, see N84-33758 through N84-33764.

N84-33758# Office National d'Etudes et de Recherches Aerospatiales, Toulouse (France). Centre d'Etudes et de Recherches.
DESCRIPTION AND PREDICTION OF TRANSITION IN TWO-DIMENSIONAL, INCOMPRESSIBLE FLOW
Daniel Arnal *In* AGARD Spec. Course on Stability and Transition of Laminar Flow Jun. 1984 71 p refs (For primary document see N84-33757 23-34)
Copyright. Avail: NTIS HC A13/MF A01

Transition problems in two dimensional, incompressible flows were surveyed. The phenomena which lead to turbulence under the influence of various factors are described: free stream turbulence, sound, pressure gradient, oscillations of the external flow, roughness, suction, wall curvature. Linear and nonlinear stability theories are discussed. Results of the application of the structure and to the growth of turbulent spots and the progressive disappearance of intermittency phenomenon are reviewed. Practical methods for calculating the transition onset and the transition region itself are described. Methods based on linear stability theory, empirical criteria, intermittency methods and turbulence models are presented. E.A.K.

N84-33759*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
BOUNDARY-LAYER LINEAR STABILITY THEORY
Leslie M. Mack *In* AGARD Spec. Course on Stability and Transition of Laminar Flow Jun. 1984 81 p refs (For primary document see N84-33757 23-34)
Copyright. Avail: NTIS HC A13/MF A01 CSCL 20D

Most fluid flows are turbulent rather than laminar and the reason for this was studied. One of the earliest explanations was that laminar flow is unstable, and the linear instability theory was first developed to explore this possibility. A series of early papers by Rayleigh produced many notable results concerning the instability of inviscid flows, such as the discovery of inflectional instability. Viscosity was commonly thought to act only to stabilize the flow, and flows with convex velocity profiles appeared to be stable. The investigations that led to a viscous theory of boundary layer instability was reported. The earliest application of linear stability theory to transition prediction calculated the amplitude ratio of the most amplified frequency as a function of Reynolds number for a Blasius boundary layer, and found that this quantity had values between five and nine at the observed Ret. The experiment of Schubauer and Skramstad (1947) completely reversed the prevailing option and fully vindicated the Gottingen proponents of the theory. This experiment demonstrated the existence of instability waves in a boundary layer, their connection with transition, and the quantitative description of their behavior by the theory of Tollmien and Schlichting. It is generally accepted that flow parameters such as pressure gradient, suction and heat transfer qualitatively affect transition in the manner predicted by the linear theory, and in particular that a flow predicted to be stable by the theory should remain laminar. The linear theory, in the form of the e9, or N-factor is today in routine use in engineering studies of laminar flow. The stability theory to boundary layers with pressure gradients and suction was applied. The only large body of numerical results for exact boundary layer solutions before the advent of the computer age by calculating the stability characteristics of the Falkner-Skan family of velocity profiles are given. When the digital computer reached a stage of development which permit the direct solution of the primary differential equations, numerical results were obtained from the linear theory during the next 10 years for many different boundary layer flows: three dimensional boundary layers; free convention boundary layers; compressible boundary layers; boundary layers on compliant walls; a recomputation of Falkner-Skan flows; unsteady boundary layers; and heated wall boundary layers. E.A.K.

N84-33760# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Mechanics and Aerospace Engineering.
ENVIRONMENT AND RECEPTIVITY
E. Reshotko *In* AGARD Spec. Course on Stability and Transition of Laminar Flow Jun. 1984 11 p refs (For primary document see N84-33757 23-34)
Copyright. Avail: NTIS HC A13/MF A01

In an environment where initial disturbance levels are small, the transition Reynolds number of a boundary layer is dependent upon the nature and spectrum of the disturbance environment, the signatures in the boundary layer of these disturbances and their excitation of the normal modes, receptivity, and finally the linear and nonlinear amplification of the growing modes. The progress in understanding receptivity to free stream vorticity and acoustic disturbances is reviewed. The technique of the initial value problem, which promises to be a significant additional tool for providing guidance toward the resolution of receptivity issues is outlined. E.A.K.

N84-33761# Cranfield Inst. of Tech., Bedfordshire (England).
TRANSITION DESCRIPTION AND PREDICTION IN THREE-DIMENSIONAL FLOWS
D. I. A. Poll *In* AGARD Spec. Course on Stability and Transition of Laminar Flow Jun. 1984 23 p (For primary document see N84-33757 23-34)
Copyright. Avail: NTIS HC A13/MF A01

The implications of mean flow three dimensionality which have a high priority in design engineering systems in which boundary layer transition is an important factor are examined. Two projects are under development which illustrate the importance of three dimensional effects; these are the swept laminar flow wing and the space shuttle projects. Leading edge problems and the consequences of three dimensional mean flow are discussed in the context of transition taking place in the immediate vicinity of the leading edge of a swept wing, which is a situation where the transition process has particular engineering significance. The mechanisms and principles discussed are examined in relation to more complex situations and also to transition in compressible flows with heat transfer. E.A.K.

N84-33762# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
NONLINEAR EFFECTS IN HYDRODYNAMIC STABILITY
Thorwald Herbert *In* AGARD Spec. Course on Stability and Transition of Laminar Flow Jun. 1984 10 p refs (For primary document see N84-33757 23-34)
Copyright. Avail: NTIS HC A13/MF A01

Nonlinear effects which are caused by insufficient agreement between observation and results of the linear theory for the prototypes of Taylor-Couette flow and plane Poiseuille flow are analyzed. The principal methods for the analysis of nonlinear problems are characterized. The weak nonlinear theory for a single normal mode and the calculation and use of high order Landau constants is discussed. Weakly nonlinear models of observed phenomena are surveyed. E.A.K.

N84-33763# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
SECONDARY INSTABILITY OF SHEAR FLOWS
Thorwald Herbert *In* AGARD Spec. Course on Stability and Transition of Laminar Flow Jun. 1984 13 p refs (For primary document see N84-33757 23-34)
Copyright. Avail: NTIS HC A13/MF A01

The appearance of secondary instability in shear flows was reviewed. The mixing layer, the flat plate boundary layer, and plane Poiseuille flow are considered as prototype flows. The computational and analytical work which produced conceptual enlightenment is discussed. A theory of secondary instability is presented: the almost periodic flow that develops in the presence of finite-amplitude traveling waves is used as a basic flow for a linear stability analysis with respect to spanwise periodic, three dimensional disturbances. The Hill type stability equations with periodic coefficients allow for various classes of normal modes that are associated with different types of resonance. A numerical method for solving the secondary stability problem is discussed. Results for fundamental and subharmonic modes in plane Poiseuille flow are reviewed. The present scope of the theory and its potential for future extensions are discussed. E.A.K.

N84-33764# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Mechanics and Aerospace Engineering.
LAMINAR FLOW CONTROL - VISCOUS SIMULATION
E. Reshotko *In* AGARD Spec. Course on Stability and Transition of Laminar Flow Jun. 1984 10 p refs (For primary document see N84-33757 23-34)
Copyright. Avail: NTIS HC A13/MF A01

Laminar flow control which offers the possibility of major reductions in aircraft drag is described. The theoretical background for the possible stabilizations of the laminar boundary layer due to shaping, suction and cooling is presented. The effects of vehicle and environmental factors on the implementation of that technology are examined. Viscous simulation is the technology of adjusting boundary layer conditions on a wind tunnel model so that results can be reliably extrapolated to flight conditions. The need for an underlying simulation methodology, some alternate methodologies, the needed boundary/layer controls/trips for implementation, and the process of scaling wind tunnel results to flight conditions are outlined. E.A.K.

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources*. For related information see also *06 Aircraft Instrumentation*, and *19 Spacecraft Instrumentation*.

N84-33765* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
IMAGING X-RAY SPECTROMETER Patent
Patrick A. Grant, John W. Jackson, Jr., George E. Alcorn, and Francis E. Marshall, inventors (to NASA) Issued 18 Sep. 1984 6 p Filed 19 Feb. 1982 Supersedes N82-26629 (20 - 17, p 2404)
(NASA-Case-GSC-12682-1; NAS 1.71:GSC-12682-1;
US-Patent-4,472,728; US-Patent-Appl-SN-350477;
US-Patent-Class-357-30; US-Patent-Class-357-29;
US-Patent-Class-357-32; US-Patent-Class-250-385;
US-Patent-Class-250-367; US-Patent-Class-250-483.1) Avail: US Patent and Trademark Office CSCL 14B

An X-ray spectrometer for providing imaging and energy resolution of an X-ray source is described. This spectrometer is comprised of a thick silicon wafer having an embedded matrix or grid of aluminum completely through the wafer fabricated, for example, by thermal migration. The aluminum matrix defines the walls of a rectangular array of silicon X-ray detector cells or pixels. A thermally diffused aluminum electrode is also formed centrally through each of the silicon cells with biasing means being connected to the aluminum cell walls and causes lateral charge carrier depletion between the cell walls so that incident X-ray energy causes a photoelectric reaction within the silicon producing collectible charge carriers in the form of electrons which are collected and used for imaging.

Official Gazette of the U.S. Patent and Trademark Office

N84-33766* National Aeronautics and Space Administration. Pasadena Office, Calif.
PORTABLE REFLECTANCE SPECTROMETER Patent
Alexander F. H. Goetz (JPL, California Inst. of Tech., Pasadena), Richard A. Graham (JPL, California Inst. of Tech., Pasadena), and Tetsuo Ozawa, inventors (to NASA) (JPL, California Inst. of Tech., Pasadena) Issued 23 Aug. 1977 9 p Filed 24 Mar. 1975 Sponsored by NASA
(NASA-Case-NPO-13556-1; NAS 1.71:NPO-13556-1;
US-Patent-4,043,668; US-Patent-Appl-SN-561369;
US-Patent-Class-356-73; US-Patent-Class-250-339;
US-Patent-Class-356-74; US-Patent-Class-356-188;
US-Patent-Class-356-189) Avail: US Patent and Trademark Office CSCL 14B

A portable reflectance spectrometer is disclosed. The spectrometer essentially includes an optical unit and an electronic recording unit. The optical unit includes a pair of thermoelectrically-cooled detectors, for detecting total radiance and selected radiance projected through a circular variable filter wheel, and is capable of operating to provide spectral data in the range 0.4 micrometers without requiring coventional substitution of filter elements. The electronic recording unit includes power supplies, amplifiers, and digital recording electronics designed to permit recordation of data on tape casettes. Both the optical unit and electronic recording unit are packaged to be manually portable. NASA

N84-33767* National Aeronautics and Space Administration. Pasadena Office, Calif.
MEANS AND METHOD FOR CALIBRATING A PHOTON DETECTOR UTILIZING ELECTRON-PHOTON COINCIDENCE Patent
Santosh K. Srivastava, inventor (to NASA) (JPL, California Inst. of Tech., Pasadena) Issued 4 Sep. 1984 9 p Filed 15 Mar. 1982 Supersedes N82-24953 (20 - 15, p 2154) Sponsored by NASA
(NASA-Case-NPO-15644-1; NAS 1.71:NPO-15644-1;
US-Patent-4,469,942; US-Patent-Appl-SN-358088;
US-Patent-Class-250-252.1; US-Patent-Class-250-251;
US-Patent-Class-250-372) Avail: US Patent and Trademark Office CSCL 14B

An arrangement for calibrating a photon detector particularly applicable for the ultraviolet and vacuum ultraviolet regions is based on electron photon coincidence utilizing crossed electron beam atom beam collisions. Atoms are excited by electrons which lose a known amount of energy and scatter with a known remaining energy, while the excited atoms emit photons of known radiation. Electrons of the known remaining energy are separated from other electrons and are counted. Photons emitted in a direction related to the particular direction of scattered electrons are detected to serve as a standard. Each of the electrons is used to initiate the measurements of a time interval which terminates with the arrival of a photon exciting the photon detector. Only the number of time intervals related to the coincidence correlation and of electrons scattered in the particular direction with the known remaining energy and photons of a particular radiation level emitted due to the collisions of such scattered electrons are counted. The detector calibration is related to the number of counted electrons and photons.

Official Gazette of the U.S. Patent and Trademark Office

N84-33768* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
LONGWALL SHEARER TRACKING SYSTEM Patent
Peter D. Poulsen, inventor (to NASA) (Adjunct Systems, Inc.), Richard J. Stein, and Robert E. Pease Issued 21 Aug. 1984

13 p Filed 15 Nov. 1982 Supersedes N83-14607 (21 - 05, p 0692) Sponsored by NASA
(NASA-Case-MFS-25717-1; NAS 1.71:MFS-25717-1; US-Patent-4,466,667; US-Patent-Appl-SN-441897; US-Patent-Class-299-1; US-Patent-Class-175-45) Avail: US Patent and Trademark Office CSCL 14B

A tracking system for measuring and recording the movements of a longwall shearer vehicle includes an optical tracking assembly carried at one end of a desired vehicle path and a retroreflector assembly carried by the vehicle. Continuous horizontal and vertical light beams are alternately transmitted by means of a rotating Dove prism to the reflector assembly. A vertically reciprocating reflector interrupts the continuous light beams and converts these to discrete horizontal and vertical light beam images transmitted at spaced intervals along the path. A second rotating Dove prism rotates the vertical images to convert them to a second series of horizontal images while the first mentioned horizontal images are left unrotated and horizontal. The images are recorded on a film.
NASA

N84-33769* National Aeronautics and Space Administration. Pasadena Office, Calif.
PHASE SENSITIVE GUIDANCE SENSOR FOR WIRE-FOLLOWING VEHICLES Patent
George R. Hansen, inventor (to NASA) (JPL, California Inst. of Tech., Pasadena) Issued 18 Sep. 1984 7 p Filed 30 Oct. 1981 Supersedes N82-12346 (20 - 03, p 0333) Sponsored by NASA
(NASA-Case-NPO-15341-1; NAS 1.71:NPO-15341-1; US-Patent-4,472,716; US-Patent-Appl-SN-315583; US-Patent-Class-340-905; US-Patent-Class-180-168; US-Patent-Class-318-587; US-Patent-Class-340-988) Avail: US Patent and Trademark Office CSCL 14B

A guidance sensor for a wire-following vehicle which is phase sensitive, includes an array of coils positioned to sense the vertical component of a magnetic field produced by the ac current through the guidance wire. The outputs of the coils are fed to associated flip flops. Flip flops associated with coils, through which flux passes in one direction, e.g., up, are driven to one state, e.g., true, and flip flops associated with coils through which flux passes in the opposite direction, e.g., down, are driven to a false state. The control signal to guide the vehicle over the wire is a function of the number of flip flops in the true state. Circuitry is included to prevent flip flops from assuming a wrong state due to noise.
NASA

N84-33770 Department of the Air Force, Washington, D.C.
MOUNTING ARRANGEMENT FOR AN INERTIAL MEASUREMENT UNIT Patent
K. D. Shinkle, inventor (to Air Force) Issued 15 May 1984 7 p Supersedes AD-D009631
(AD-D011148; US-Patent-4,448,377; US-Patent-Appl-SN-379806; US-Patent-Class-248-178) Avail: US Patent and Trademark Office CSCL 14/2

In a mounting arrangement for an instrument, such as an inertial measurement unit, a mounting frame is pivotably mounted to a platform for rotation about a vertical axis and a support frame is rotatably mounted to the mounting frame for rotation about a horizontal axis. The support frame supports the instrument. A horizontal lock and motion assembly interconnects the mounting frame and platform, and allows adjustment of the angular position of the mounting frame about the vertical axis relative to the platform when the mounting frame is locked to the platform. A vertical lock and motion assembly interconnects the support frame and mounting frame, and allows adjustment of the angular position of the support frame about the horizontal axis relative to the mounting frame when the support frame is locked to the mounting frame.
GRA

N84-33771 Department of the Navy, Washington, D. C.
OPTICAL FIBER GYROSCOPE WITH (3X3) DIRECTIONAL COUPLER Patent
S. K. Sheem, inventor (to Navy) Issued 3 Apr. 1984 6 p Supersedes AD-D010337
(AD-D011152; US-Patent-4,440,498; US-Patent-Appl-SN-320999; US-Patent-Class-356-350) Avail: US Patent and Trademark Office CSCL 17/7

Document describes a sagnac rotation sensing interferometer disposed on a rotating platform for use as a gyroscope comprising a closed optical light path and a beam splitter for splitting an input light beam into two beams directed to transverse the closed optical path in opposite directions wherein the beam splitter is composed of a directional coupler with three input ports and three output ports. The first of the three input ports receives optical input and the second and third of the input ports are disposed symmetrically with respect to the first input port. Optical output from two output ports corresponding to the second and third input ports are directed to both ends of the closed optical fiber light path. A gyroscope according to this arrangement provides light output from the beam splitter which operates automatically near quadrature without a nonreciprocal pi/2 phase bias applied in the fiber loop as required in conventional optical fiber gyroscopes.
Author (GRA)

N84-33772*# National Aeronautics and Space Administration, Washington, D. C.
BALLOON TEST PROJECT: COSMIC RAY ANTIMATTER CALORIMETER (CRAC)
J. C. Christy, G. Dhenain, P. Goret, J. Jorand, P. Masse, P. Mestreau, N. Petrou, and A. Robin Jan. 1984 32 p refs Transl. into ENGLISH of "Projet d'Experience Balloon CRAC" Rept. DPhG/SAP-83-14R-Phg France, 21 Apr. 1983 p 1-28 Transl. by Scientific Translation Services, Santa Barbara, Calif. Original doc. prep. by Inst. de Recherche Fondamentale, Gif-Sur-Yvette, France
(Contract NASw-3542)
(NASA-TM-77461; NAS 1.15:77461; DPhG/SAP-83-14R-Phg) Avail: NTIS HC A03/MF A01 CSCL 14B

Cosmic ray observations from balloon flights are discussed. The cosmic ray antimatter calorimeter (CRAC) experiment attempts to measure the flux of antimatter in the 200-600 Mev/m energy range and the isotopes of light elements between 600 and 1,000 Mev/m.
E.A.K.

N84-33773*# Alabama Univ., University.
PINHOLE/CORONOGRAPH POINTING CONTROL SYSTEM INTEGRATION AND NOISE REDUCTION ANALYSIS Final Report
Michael Greene Sep. 1981 332 p
(Contract NAS8-34529)
(NASA-CR-171152; NAS 1.26:171152; BER-274-100) Avail: NTIS HC A15/MF A01 CSCL 14B

The Pinhole Occulter Facility (P/OF) is a Space Shuttle based experiment for the production of solar coronographics and hard X-ray images. The system is basically pinhole camera utilizing a deployable 50-m flexible boom for separating the pinholes and coronograph shields from the recording devices located in the Shuttle bay. At the distal end of the boom from the Shuttle is a 25 kg mask containing pinholes and coronograph shields. At the proximal end the detectors are located and mounted, along with the deployable boom, to the ASPS gimbal pointing system (AGS). The mask must be pointed at the Sun with a high degree of pointing stability and accuracy to align the axes of the detectors with the pinholes and shields. Failure to do so will result in a blurring of the images on the detectors and a loss of resolution. Being a Shuttle based experiment, the system will be subjected to the disturbances of the Shuttle. The worst of these is thruster firing for orbit correction; the Shuttle uses a bang-bang thruster control system to maintain orbit to within preset limits. Other disturbances include man motion, motion induced by other systems, and gravity gradient torques.
R.J.F.

N84-33774# Oak Ridge Y-12 Plant, Tenn. Instrumentation and Characterization Dept.
IMPROVED TECHNIQUES FOR DATA ACQUISITION AND ANALYSIS ON X-RAY DIFFRACTION EQUIPMENT
K. W. Kaiser, J. J. Dunigan, and P. J. Holzhauser 11 Jul. 1983

70 p
(Contract W-7405-eng-26)
(Y-2282) Avail: NTIS HC A04/MF A01

Three X-ray powder diffractometers operated by the Microanalysis Group have been fully automated with LSI-11/2-based microcomputer systems. All timing, counting, and diffractometer positioning are controlled by software written in FORTRAN and MACRO running under the RT-11 operating system. The operator may select the optimum scan sequence to fit the type of sample being tested from a variety of scanning options. A DECnet link and a remote graphics terminal have been installed to give remote access to a host computer. A new data reduction has been introduced that combines multiple data analysis techniques for an entire sample scan into one program. Author

N84-33775# Morgantown Technology Center, W. Va.
AN EVALUATION OF THE MALVERN OPTICAL PARTICLE MONITOR
Rodney J. Anderson and Edward Johnson Jul. 1983 39 p refs
(DE83-017039; DOE/METC-83/69) Avail: NTIS HC A03/MF A01

Operational characteristics, limitations, and accuracy were determined for the Malvern 2200/3300 particle sizer, a laser-based optical particle sizing device which utilizes the principle of Fraunhofer Diffraction as the means of particle size measurement. This investigation focused on relatively small particles in the range of 5 to 150 microns. Primarily, well characterized particles of coal in a coal and water mixture were utilized, but a selection of naturally occurring, industrially generated, and standard samples (i.e., glass beads) were also tested. Results discussed cover sample-to-lense distance and sample concentration; the applicability to aerosols; tests of the manufacturer supplied software; and size measurement comparisons with the results of Coulter analysis. Characteristics of the software data-fitting routine were also examined. Criteria to select which of the three available distribution functions (Normal, Rosin-Rammler, and Log-Normal) best fits the data were determined and sensitivity to abnormal data was tested. The use of model independent software, in cases of data known to or not to possess one of the three available size distributions, was also examined. A.R.H.

N84-33776# Naval Surface Weapons Center, White Oak, Md.
PROPERTIES OF PRINCIPAL TL (THERMOLUMINESCENCE) DOSIMETERS Final Report
V. K. Mathur Oct. 1983 34 p
(AD-A143635; NSWC/TR-83-382) Avail: NTIS HC A03/MF A01 CSCL 06/18

Of the various techniques that can be used for personnel dosimetry, thermoluminescence dosimetry has emerged as a superior technique due to its manifold advantages over other methods of dose estimation. This has led to the formulation of desired characteristics of a TL dosimeter. Various phosphors have been therefore investigated regarding their suitability for dosimetry. A brief description of important TL materials and their properties is documented in this report. Author (GRA)

N84-33777# Department of the Air Force, Washington, D.C.
APPLIQUE RATE CONVERTER Patent Application
L. R. Novick, inventor (to Air Force) Filed 18 Apr. 1984 18 p
(AD-D011161; US-Patent-Appl-SN-601520) Avail: NTIS HC A02/MF A01 CSCL 17/2

The applique rate converter permits a digital multiplexer to support any data rate less than half of its input port design rate. The applique rate converter develops a composite data stream consisting of alternate data bits and data boundary bits. The data boundary bits change state at each new data bit (corresponding to a change in the data clock). The composite bit stream is increased to the output data rate by means of a circuit called the synchronizer. At the demultiplex side of the applique, the data is separated from the composite stream by a decoding process and, if necessary, the data stream is rate smoothed. The major sections of the applique rate converter are the synchronizer at the multiplex side and the data separator and rate smoothing circuits at the demultiplex side. Author (GRA)

N84-33778# Department of the Air Force, Washington, D.C.
MULTI-(OTeF5)-SUBSTITUTED FLUOROCARBONS Patent Application
C. J. Schack and K. O. Christe, inventors (to Air Force) Filed 29 May 1984 10 p
(AD-D011171; US-Patent-Appl-SN-617456) Avail: NTIS HC A02/MF A01 CSCL 07/3

This invention relates of high density fluorocarbon fluids. High density fluids are desired for use in improved gyroscopes. GRA

N84-33779# California Univ., Livermore. Lawrence Livermore Lab.
AUTOMATED HELIUM GAS METERING SYSTEM
K. L. Blaedel, J. D. Cervelli, G. Koide, and C. H. Radewan 17 Jul. 1984 29 p refs
(Contract W-7405-eng-48)
(DE84-015083; UCID-20123) Avail: NTIS HC A03/MF A01

The design and operation of a computerized high pressure gas metering system is described. This system controls pressure up to 16,000 psi at rates of 25 to 5000 psi/min with a 500 cc vessel. Digital feedback control and estimation techniques are used to track a predefined pressure profile that can include positive, negative, and zero rates. Thirty eight instrumentation channels are available for monitoring a test run and data acquisition. During the experiment, up to eight preselected curves can be plotted and numerical data from all transducers are displayed with physical units in real time. A dynamic diagram shows the status of the system. DOE

N84-33780# Department of Energy, Washington, D. C.
PIEZOELECTRIC SHEAR WAVE RESONATOR AND METHOD OF MAKING SAME Patent Application
Jin S. Wang, Kenneth M. Lakin, and Allen R. Landin, inventors (to DOE) Filed 25 Oct. 1983 34 p
(Contract W-7405-eng-82)
(DE84-014528; US-Patent-Appl-SN-545411) Avail: NTIS HC A03/MF A01

An acoustic shear wave resonator is described comprising a piezoelectric film having its C-axis substantially inclined from the film normal such that the shear wave coupling coefficient significantly exceeds the longitudinal wave coupling coefficient, whereby the film is capable of shear wave resonance, and means for exciting said film to resonate. The film is prepared by deposition in a dc planar magnetron sputtering system to which a supplemental electric field is applied. The resonator structure may also include a semiconductor material having a positive temperature coefficient of resonance such that the resonator has a temperature coefficient of resonance approaching 0 ppM/(0)C. DOE

N84-33781# Department of Energy, Washington, D. C.
MONOCHROMATOR FOR CONTINUOUS SPECTRUM X-RAY RADIATION Patent Application
Jean-Louis Staudenmann and Gerald L. Liedl, inventors (to DOE) Filed 2 Dec. 1983 20 p
(Contract W-7405-eng-2)
(DE84-014239; US-Patent-Appl-SN-557517) Avail: NTIS HC A02/MF A01

A monochromator for use with synchrotron X-ray radiation comprises two diffraction means which can be rotated independently and independent means for translationally moving one diffraction means with respect to the other. The independence of the rotational and translational motions allows Bragg angles from 3.5 to 86.5 degrees, and facilitates precise and high resolution monochromatization over a wide energy range. The diffraction means are removably mounted so as to be readily interchangeable, which allows the monochromator to be used for both nondispersive and low dispersive. DOE

N84-33782# Department of Energy, Washington, D. C.
THERMOLUMINESCENCE DOSIMETER Patent Application

Robert Zendle, inventor (to DOE) Filed 3 Nov. 1983 13 p
(Contract DE-AC12-76SN-00052)
(DE84-014247; US-Patent-Appl-SN-548278) Avail: NTIS HC A02/MF A01

A thermoluminescence dosimeter having a very small rate of decline of sensitivity during subsequent uses after heating in an enclosure in which the detector crystal is located. The glass enclosure is air tight and is filled with a super dry inert fill gas. The inert fill gas is nonreactive with the detector crystal when the detector crystal is heated to thermoluminescence. The fill gas is selected from the group consisting of air, nitrogen, and argon, suitably admixed with 5 to 25 percent helium. The detector crystal consists essentially of calcium fluoride. The fill gas is preferably contained at a subatmospheric pressure in the glass enclosure. DOE

N84-33783# Department of Energy, Washington, D. C.
SIDETONE GENERATOR FLOWMETER Patent Application
Robert J. Fritz, inventor (to DOE) Filed 3 Nov. 1983 10 p
(Contract DE-AC12-76SN-00052)
(DE84-014246; US-Patent-Appl-SN-548277) Avail: NTIS HC A02/MF A01

A flowmeter is described which uses the sidetones generated in a cavity formed in the wall of a flowpipe in response to fluid flowing past the cavity to provide a measure of the flow velocity of that fluid. The dimensions of the cavity provides a dominant vibratory frequency which is sensed by a pressure sensor. The flowmeter is adapted for use for a range of frequencies in which the Strouhal number is constant and under these conditions the vibratory frequency is directly related to the flow rate. The tone generator cavity and pressure transducer form a unit which is connected in line in the flowpipe. DOE

N84-33784# Bendix Corp., Kansas City, Mo.
THREE-AXIS GAGING PROBE Final Report
R. J. Russell Jul. 1984 28 p ref
(Contract DE-AC04-76DP-00613)
(DE84-015087; BDX-613-3072) Avail: NTIS HC A03/MF A01

Design improvements and testing of a three axis gaging probe were completed. When used in conjunction with a computer interfaced coordinate measuring machine, the probe increases the machine's flexibility while reducing setup errors and providing the capability of performing direct real time contour measurements. DOE

N84-33785# Research Inst. of National Defence, Linkoeping (Sweden). Dept. 3.
SCINTILLOMETER FOR MEASURING ATMOSPHERIC TURBULENCE
Stefan Wermmo and Goeran Bolander May 1984 54 p refs In SWEDISH; ENGLISH summary
(FOA-C-30363-E1; ISSN-0347-3708) Avail: NTIS HC A04/MF A01; Research Institute of National Defence, Stockholm KR 50

A microprocessor controlled turbulence measuring system was developed for field tests for quantifying the effects of atmospheric turbulence on laser beams. The method is based on the reflection of a laser beam against a corner cube reflector, and the calculation of the variance of the logarithm of the reflected beam intensity, giving the structure parameter for the atmospheric refractivity. The transmitter and the receiver are located in one unit. No performance data are presented. Author (ESA)

N84-33786# Kernforschungsanlage, Juelich (West Germany). Inst. fuer Plasmaphysik.
A HIGH RESOLUTION SYSTEM FOR ANALOGUE RECORDING AND DIGITAL PROCESSING OF MEASURED VALUES IN FUSION RESEARCH
M. Korten, M. Lochter, and W. R. Lange (Lange Electronic G.m.b.H) Apr. 1984 50 p refs In GERMAN; ENGLISH summary Presented at European Telemetry Conf. (ETC), Boeblingen, West Germany, 21-24 May 1984
(JUEL-1909; ISSN-0366-0885) Avail: NTIS HC A03/MF A01

A recording and processing system to investigate the parameters of a fusion plasma and plasma-wall interaction is presented. A hybrid system consisting of an analog tape recorder combined with a computerized digital acquisition and processing system was elaborated to obtain a temporal resolution of 100 kHz sampling rate over a period of 4 sec for several parallel signal channels. The digital signals are used to preselect the relevant intervals to be retrieved for detailed processing. The output signals of the tape recorder are fed into analog to digital converters. Frequency responses of 0.2 to 300 kHz for direct channels and 40 kHz for DC FM-channels are obtained for a tape speed of 100 ips. Author (ESA)

N84-33787# Vacuumschmelze G.m.b.H., Hanau (West Germany).
INVESTIGATIONS OF MAGNETIC WIRES FOR SENSOR APPLICATIONS Final Report, Jun. 1982
Christian Radeloff and Gerd Rauscher Bonn Bundesministerium fuer Forschung und Technologie Jun. 1984 50 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-110; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 10,50

Fast magnetic reversal phenomena in ferromagnetic wires were investigated. A measurement device was set up with which the induced voltages and hysteresis loops can be measured and shown under computer control. Detailed measurements were made on Wiegand modules, wires made of Vicalloy (52Co-10V-Fe). The fast remagnetization of this specimen is independent of the time rate of change of the driving field. A fast magnetic reversal less critical in application in comparison with the Wiegand effect is obtained. Specimens consisting of semi-hard square-loop materials were investigated with regard to their magnetic reversal properties. Author (ESA)

N84-33788# Krohne Messtechnik G.m.b.H. und Co. K.G., Duisburg (West Germany). Entwicklungslab.
A STUDY FOR DEVELOPING AN ULTRASONIC DOPPLER FLOWMETER Final Report, Dec. 1981
Martin Biermans and Robert Bregman Bonn Bundesministerium fuer Forschung und Technologie Jun. 1984 71 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-135; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 15

The system parameters for low cost ultrasonic Doppler flowmeters for medical applications were investigated. A flowmeter was built. A phase locked loop is used to find the correct Doppler shift. Laboratory and field tests prove the success of the development, although very often insufficient reflectors exist in the liquids. The accuracy is + or - 5%; the reproducibility is + or - 0.5%. Author (ESA)

N84-33789# Techno System Developments, Naples (Italy).
MULTIPOINT METHOD FOR SAMPLE TEMPERATURE MEASUREMENT IN A MIRROR FURNACE
1984 64 p refs
(Contract ESA-5753/82)
(TS-14-83; ESA-CR(P)-1902) Avail: NTIS HC A04/MF A01

A multipoint method of obtaining an accurate sample surface temperature evaluation in a mirror furnace by performing pyrometric measurements at different wavelengths is proposed. The measurements are used to compute the unknowns in a set of equations describing the signals detected by the pyrometer, via the Newton-Raphson method. The solution is simplified by assuming that bulb and ampoule emissivity are independent of temperature and depend only on wavelength. Reflectivity of sample and ampoule is assumed to be constant. Success of the method depends on the initial guess for temperatures and the disturbance factors. Author (ESA)

N84-33948*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DIGITAL FILTER PROCESSOR DESIGN FOR SPACEBORNE SCATTEROMETERS
D. Long, C. Chi, and F. Li *In* ESA IGARSS 84. Remote Sensing: From Res. towards Operational Use, Vol. 2 Aug. 1984 p 569-572 refs Sponsored by NASA (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 14B

N84-33955*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Tracking Systems and Applications Section.
CALIBRATION OF PRECISE SATELLITE ALTIMETRY FOR THE IONOSPHERE AND WET TROPOSPHERE
J. R. Benada and P. S. Callahan *In* ESA IGARSS 84: Remote Sensing: From Res. towards Operational Use, Vol. 2 Aug. 1984 p 615-618 refs (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 14B

N84-33956*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SASS 1 MODEL FUNCTION EVALUATION AND UPGRADE
C. L. Britt (Research Triangle Inst., Research Triangle Park, N.C.) and L. C. Schroeder *In* ESA IGARSS 84: Remote Sensing: From Res. towards Operational Use, Vol. 2 Aug. 1984 p 623-629 refs (For primary document see N84-33946 23-43)
(Contract NAS1-15338)
Avail: NTIS HC A15/MF A01 CSCL 14B

N84-33976*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
AIRBORNE VISIBLE/INFRARED IMAGING SPECTROMETER (AVIRIS): AN ADVANCED TOOL FOR EARTH REMOTE SENSING
G. Vane, M. Chrisp, H. Enmark, S. Solomon and J. Macenka *In* ESA IGARSS 84 Remote Sensing: From Res. Towards Operational Use, Vol. 2 Aug. 1984 p 751-757 refs Sponsored by NASA (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 14B

N84-33977*# RCA Advanced Technology Labs., Camden, N. J.
MULTISPECTRAL LINEAR ARRAY VISIBLE AND SHORTWAVE INFRARED SENSORS
J. R. Tower, F. B. Warren, L. E. Pellon, R.T. Strong, H. Elabd (RCA Labs.), A. D. Cope (RCA Labs.), D. M. Hoffmann (RCA Labs.), W. M. Kramer (RCA Electro Optics Division, Lancaster, Pennsylvania), and R. W. Longsderff (RCA Electro Optics Division, Lancaster, Pennsylvania) *In* ESA IGARSS 84 Remote Sensing: From Res. Towards Operational Use, Vol. 2 Aug. 1984 p 759-764 refs (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 14B

N84-33978*# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany).
PRELIMINARY INVESTIGATIONS CONCERNING A 90 GHz RADIOMETER SATELLITE EXPERIMENT
F. Heel and H. Kietzmann *In* ESA IGARSS 84 Remote Sensing: From Res. Towards Operational Use, Vol. 2 Aug. 1984 p 765-769 refs (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 14B

N84-33979*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
NASA SCATTEROMETER RESEARCH DATA PROCESSING SYSTEM: REQUIREMENTS AND DESIGN
P. S. Callahan, J. R. Benada, E. L. Noon, G. E. Leach, J. W. Brown, G. Pihos, P. J. McCabe, and D. B. Lame *In* ESA IGARSS 84 Remote Sensing: From Res. Towards Operational Use, Vol. 2 Aug. 1984 p 771-776 refs (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 14B

N84-33980*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
NASA SCATTEROMETER ON NROSS: A SYSTEM FOR GLOBAL OBSERVATIONS OF OCEANIC WINDS
F. Li, P. Callahan, M. Freilich, D. Lame, and C. Winn *In* ESA IGARSS 84 Remote Sensing: From Res. Towards Operational Use, Vol. 2 Aug. 1984 p 777-780 refs Sponsored by NASA (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 14B

N84-33990*# Marconi Space and Defence Systems Ltd., Portsmouth (England).
THE ACTIVE MICROWAVE INSTRUMENT FOR ERS-1
H. Joyce, R. P. Cox, and F. G. Sawyer *In* ESA IGARSS 84 Remote Sensing: From Res. Towards Operational Use, Vol. 2 Aug. 1984 p 835-840 refs (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 14B

N84-33991*# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
ERS-1 SYSTEM SIMULATION AND CALIBRATION
P. Hans, H. M. Braun, and H. Groebke *In* ESA IGARSS 84 Remote Sensing: From Res. Towards Operational Use, Vol. 2 Aug. 1984 p 841-846 refs (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 14B

N84-33993*# Marconi Space and Defence Systems Ltd., Portsmouth (England).
THE IN-FLIGHT CALIBRATION OF A SATELLITE-BORNE WIND SCATTEROMETER
D. J. Q. Carter and P. Hans (Dornier-Werke G.m.b.H., Friedrichshafen, West Germany) *In* ESA IGARSS 84 Remote Sensing: From Res. Towards Operational Use, Vol. 2 Aug. 1984 p 853-858 (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 14B

36 LASERS AND MASERS

Includes parametric amplifiers.

N84-33790# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
THE THEORY OF FREE ELECTRON LASERS M.S. Thesis [TEORIA DO LASER DE ELETRONS LIVRES]
Rafael Alves Correa Jun. 1984 171 p refs In PORTUGUESE; ENGLISH summary
(INPE-3158-TDL/170) Avail: NTIS HC A08/MF A01

A theoretical study of free electron laser in the Raman regime is made, both in the electron beam frame and the laboratory frame, presenting the basic principles of this laser. Free electron lasers are generators of high power, tunable, coherent electromagnetic radiation. Firstly, a general model of parametric instabilities is studied by considering three simply coupled harmonic oscillators. The equations that describe a free electron laser are reduced to two coupled wave equations, showing clearly the coupling of modes and the importance of the ponderomotive force in the coupling process. An analogy between these coupled wave equations and the simply coupled harmonic oscillators equations is established, and the growth rate for the instability is obtained. The dependence of the growth rate on various parameters of the system is analyzed. Some experimental results of Raman free electron lasers are reviewed and a comparison is made with theoretical results, qualitative agreements are obtained. Author

N84-33791# Naval Postgraduate School, Monterey, Calif.
MEASUREMENT OF RANGE-RESOLVED WATER VAPOR CONCENTRATION BY COHERENT CO2 DIFFERENTIAL ABSORPTION LIDAR Ph.D. Thesis
R. M. Hardesty Mar. 1984 311 p
(AD-A143594) Avail: NTIS HC A14/MF A01 CSCL 17/9

The feasibility of DIAL (Differential Absorption Lidar) species concentration measurements using a coherent CO2 lidar was

examined. A computer simulation estimated errors in coherent and incoherent CO2 DIAL measurements due to speckle, noise, turbulence, and atmospheric inhomogeneities. Results indicated that direct-detection is the preferable mode at shorter ranges while heterodyne detection provides better sensitivity beyond a few km. The NOAA pulsed lidar was used to investigate statistical properties of the aerosol backscattered returns which are processed to obtain DIAL measurements. Fluctuations due to speckle and noise necessitate averaging of returns from multiple pulses for accurate concentration estimates. Other atmospheric effects can be minimized by judicious signal processing. The first reported range-resolved coherent DIAL water vapor measurements were made with the lidar to ranges beyond 10 km. GRA

N84-33792# M/A-COM Laser Diode, Inc., New Brunswick, N.J.
HERMETIC SINGLE LONGITUDINAL MODE CW LASERS COUPLED TO SINGLE MODE OPTICAL FIBER PIGTAILS Final Report, 1 Sep. 1982 - 23 May 1984
A. D. Ceruzzi and R. Toohey 23 May 1984 47 p
(Contract N00014-82-C-2276)
(AD-A143626) Avail: NTIS HC A03/MF A01 CSCL 11/1

The objective of this program was to investigate and develop a method for reducing the coupling efficiency losses incurred with the hermetic LDL-9 package. In addition, an alternative package construction, more conducive to hermetic seals, which does not mechanically disturb the critical alignment of the single mode fiber relative to the source diode, was developed. Table 1 summarizes the performance goals of the contract. During the course of this program, modifications to the requirements were incorporated. First, four LDT-363L epoxied units were delivered to NRL because of an urgent need to generate a few hydrophones. Secondly, a technique was developed for attaching single mode polarization preserving fiber to single mode semiconductor lasers which will be described in Section 2 of this report. Finally, three units were constructed which met all the performance goals of the contract. Author (GRA)

N84-33793# City Coll. of the City Univ. of New York.
RADIATION PRESSURE ON ATOMS: LASER COOLING AND INTENSE FIELD EFFECTS Progress Report, 1 Nov. 1983 - 30 Apr. 1984
M. S. Lubell, M. H. Mittleman, and K. Rubin 21 May 1984 11 p
(Contract N00014-83-K-0654)
(AD-A143637) Avail: NTIS HC A02/MF A01 CSCL 20/5

It is conventional to describe the motion of an atom in a laser field (and other dc fields) by a Fokker-Planck equation which is characterized by a force and a diffusion coefficient. Gordon and Ashkin have obtained a result for the diffusion coefficient in a spherically symmetric approximation. We have recently treated it as a second order tensor and have gotten a different result. The tensor has three terms. The leading term arises from the recoil of the atom during fluorescence, the second comes from gradients of the laser intensity and the dc fields and the last comes from a combination of the recoil term and gradients. The trace of our leading term agrees with the result of Gordon and Ashkin but there is no agreement at all with the other terms. The calculation was performed for a traveling wave laser and is being extended now to a standing wave laser by a graduate student. The experiment being undertaken here will use a swept laser frequency to compensate for the change in resonance frequency (due to the Doppler effect) of the atom as it slows down. GRA

N84-33794# New Hampshire Univ., Durham. Dept. of Physics.
ALKALI-SCI2 CHEMILUMINESCENCE: VIBRATIONAL POPULATION INVERSION IN THE B STATE OF S2 Interim Technical Report
J. J. Wright and L. C. Balling 24 Jul. 1984 14 p
(Contract N00014-83-K-0533)
(AD-A143639; ONR-TR-1) Avail: NTIS HC A02/MF A01 CSCL 20/5

The chemiluminescent reactions of alkali atoms with SCl2 in the presence of a buffer gas can produce a highly inverted population of the vibrational levels of the B state of S2. The results of this work support the suggestion that the S2 B-X transition is an appealing candidate for a visible wavelength chemical laser, especially if the buffer gas relaxes the high vibrational levels of the X state as well as promoting three body recombination of S2. GRA

N84-33795# Harvard Univ., Cambridge, Mass. Div. of Applied Sciences.
INTERACTION OF HIGH INTENSITY SUBNANOSECOND CO2 LASER PULSES WITH MOLECULES Final Report, 13 Apr. 1981 - 12 Apr. 1984
N. Bloembergen Jun. 1984 5 p
(Contract DAAG29-81-K-0071)
(AD-A143654; ARO-18105.8-PH) Avail: NTIS HC A02/MF A01 CSCL 20/5

The purpose of the research performed under this contract was to eliminate the influence of collisions on the infrared multiphoton excitation of poly-atomic molecules as much as possible, and to study the exchange and distribution of energy within an isolated polyatomic molecule. Extremely rapid equilibration of absorbed energy among the different modes was observed. Experiments involving time-resolved Raman spectroscopy of infrared multiphoton-excited molecules have, for the first time, provided more direct, quantitative information on intramolecular energy transfer. Author (GRA)

N84-33796# Schafer (W. J.) Associates, Inc., Wakefield, Mass.
ANALYSES ON THE LOW VOLTAGE FREE ELECTRON LASER Final Report, Oct. 1982 - Jul. 1984
S. A. Mani, J. Yoder, and J. Blimmel 16 Jul. 1984 42 p
(Contract N00014-80-C-0515)
(AD-A143681; WJSA-FTR-84-19) Avail: NTIS HC A03/MF A01 CSCL 20/5

The results of calculations on the two stage free electron laser (FEL) are presented. Methods to reduce mirror losses at mm wavelengths are suggested. Dielectric stack with teflon and air seem to be the optimum choice to reduce absorption loss. Several methods to maintain a single longitudinal mode operation of the first stage of a two stage FEL are suggested. Finally, the design issues concerned with applying axial electric field by induction to enhance FEL extraction efficiency are discussed. Author (GRA)

N84-33797# Israel Inst. of Metals, Haifa.
LASER BEAM TECHNOLOGY PROMOTING HIGH SPEED AND SELECTIVE PLATING PROCESSES Final Report, Oct. 1982 - Sep. 1983
Joseph Zahavi and Shoshana Tamir Wright-Patterson AFB, ohio AFWAL Sep. 1983 61 p
(Grant AF-AFOSR-0236-82)
(AD-A143715; AFWAL-TR-83-4113) Avail: NTIS HC A04/MF A01 CSCL 20/5

In recent years, there has been increasing interest in laser beam applications in material processes such as laser machining, laser surface treatment and laser induced chemical and electrochemical processes. This report deals primarily with laser induced selective high rate chemical deposition on metallic and polymeric substrates without masking. The experimental system used to carry out deposition processes consisted of laser beam facility, X-Y computerized table, electrolytic cell (with or without counter and reference electrode) and a computer. The laser systems used were CW. Argon laser and Q switch Nd:YAG pulsed laser. GRA

N84-33798# Battelle Columbus Labs., Ohio.
THREE-DIMENSIONAL PHOTOCHEMICAL MACHINING WITH LASERS Annual Technical Report, No. 1, 1 Jun. 1982 - 30 Jun. 1983
R. E. Schwerzel 30 Nov. 1983 92 p
(Contract F49620-82-C-0077; ARPA Order 4522)
(AD-A143928; AFOSR-84-0587TR) Avail: NTIS HC A05/MF A01 CSCL 13/8

Research on the development of new photoinitiator systems for spatially selective photochemical machining with lasers has

continued smoothly and is progressing well. The porphyrin system developed during the first quarter continues to look particularly promising. A number of potential new candidate materials have also been identified, including a rubrene sulfonyl chloride derivative. GRA

N84-33799# Mathematical Sciences Northwest, Inc., Bellevue, Wash.
TAPERED-WIGGLER FREE-ELECTRON LASER OSCILLATOR PROGRAM Final Report
J. Slater, W. Grossman, D. Quimby, A. Vetter, and J. Wilcoxon May 1984 145 p
(Contract F49620-81-C-0079)
(AD-A144053; MSNW-C.11.198.01; AFOSR-84-0623TR) Avail: NTIS HC A07/MF A01 CSCL 20/5

The purpose of this program is to provide data and analysis for assessing the potential of tapered-wiggler free-electron laser (FEL) oscillators as high-efficiency sources of coherent radiation. It is expected that the tapered-wiggler concept will lead to the development of high-efficiency FELs by providing substantial energy extraction in a single pass of the e-beam through the wiggler magnet. The work consists of parallel experimental and theory tasks. GRA

N84-33800# Battelle Columbus Labs., Ohio.
THREE-DIMENSIONAL PHOTOCHEMICAL MACHINING WITH LASERS Semiannual Technical Report, 1 Aug. 1982 - 31 Jan. 1982
R. E. Schwerzel 5 Dec. 1983 6 p
(Contract F49620-82-C-0077)
(AD-A144096; AFOSR-84-0615TR; SATR-1) Avail: NTIS HC A02/MF A01 CSCL 20/5

Research on the development of new photoinitiator systems for spatially selective photochemical machining with lasers has continued smoothly and is progressing well. The porphyrin system developed during the first quarter continues to look particularly promising. A number of potential new candidate materials have also been identified, including a rubrene sulfonyl chloride derivative. Experimental study of these new compounds was begun during the past quarter and is expected to continue for several more months to define materials properties and optical parameters have been carried out to guide this effort. Author (GRA)

N84-33801# Mound Lab., Miamisburg, Ohio.
INCORPORATION OF AN Nd:YAG LASER ENGRAVER INTO MOUND'S MACHINING OPERATIONS
James J. Zahora 10 Jul. 1984 13 p
(Contract DE-AC04-76DP-00053)
(DE84-014339; MLM-3160) Avail: NTIS HC A02/MF A01

An ND:YAG laser engraving system has become an efficient marking method for the identification of gages, tooling, and product parts. The system consists of a computer driven microprocessor programmed from a CRT terminal which directs the laser beam in its engraving path. Efficiency in marking is maximized by interchangeable, standard staging techniques. Laser marking is superior to previously used conventional methods both in speed and versatility. DOE

N84-33802# Sandia Labs., Albuquerque, N. Mex.
ULTRAVIOLET LASER TRIGGERING OF THE 6 MV PBFA-2 GAS SWITCH
R. G. Adams, D. R. Humphreys, J. R. Woodworth, M. M. Dillon, D. Green, and J. F. Seamen Jun. 1984 4 p refs Presented at the 16th Power Modulator Symp., Arlington, Va., 17 Jun. 1984
(Contract DE-AC04-76DP-00789)
(DE84-014004; SAND-84-0455C; CONF-8406137-14) Avail: NTIS HC A02/MF A01

A multistage gas switch (Rimfire) was developed for 6 MV operation in the PBFA-II ion beam accelerator. This gas switch demonstrated good high voltage survivability and was successfully triggered by the KrF laser beam at 248 nm with less than 30 mJ of energy. These laser triggered switching (LTS) experiments at approximately 5 MV achieved controlled switching with subnanosecond jitter and switch closure delay dependence upon charging voltage exhibiting slope less than 1 nsec for a 1% voltage change relative to the self-breakdown voltage (SBV). DOE

N84-33803# Department of Energy, Washington, D. C.
PREPARATION OF CERTAIN m-AMINOPHENOLS AND THE USE THEREOF FOR PREPARATION OF LASER DYES Patent Application
Peter R. Hammond, inventor (to DOE) Filed 29 Dec. 1983 44 p
(Contract W-7405-eng-48)
(DE84-014232; US-Patent-Appl-SN-566924) Avail: NTIS HC A03/MF A01

Methods are provided for making certain m-aminophenols using a sulfonation/alkali fusion procedure. The aminophenols are key intermediates in the synthesis of dyes, particularly efficient, stable dyes for laser application. Preparations of some rhodamine and phenoxazone dyes from the m-aminophenols are described. DOE

N84-33804# Department of Energy, Washington, D. C.
STABLE MIRROR MOUNT Patent Application
Ronald W. Cutburth, inventor (to DOE) Filed 4 Nov. 1983 13 p
(Contract W-7405-eng-48)
(DE84-014250; US-Patent-Appl-SN-548811) Avail: NTIS HC A02/MF A01

An improved mirror mount assembly is disclosed. The mirror mount assembly provides a post assembly slidable in a Y-axis orientation and a nut plate assembly slidable in an X-axis orientation and means for simultaneously locking said post assembly and said key assembly in a fixed position. DOE

N84-33805# URW Unternehmensberatung, Hamburg (West Germany). Abteilung Quako.
DEVELOPMENT OF HARDWARE AND SOFTWARE FOR AUTOMATIC OPTICAL SURFACE INSPECTION WITH LASER SCANNERS Final Report, Aug. 1980
Hans-Joachim Spengler and Gerold Bandhold Bonn Bundesministerium fuer Forschung und Technologie Jun. 1984 22 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-111; ISSN-0340-7608) Avail: NTIS HC A02/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 5

A laser scanner which scans a two-dimensional picture array was constructed. Pixels are digitized with 8 bit resolution and are manipulated in a computer by special software routines for gray value picture processing. Objects having different surface structures (metal, cloth, paper) were examined. Author (ESA)

N84-33806# Siemens A.G., Munich (West Germany). Forschungslab.
OPTICALLY NONLINEAR MATERIALS FOR TUNABLE UV-LASERS Final Report, Sep. 1981
Ulrich Deserno, Christian Gerndt, Franz Mayerhofer, Siegfried Haussuehl (Cologne University), Josef Liebertz (Cologne University), and Karl Recker (Bonn University) Bonn Bundesministerium fuer Forschung und Technologie Jun. 1984 185 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-133; ISSN-0340-7608) Avail: NTIS HC A09/MF A01; Fachinformatioszentrum, Karlsruhe, West Germany DM 35

Materials for tunable UV dye lasers with subsequent second harmonic generation (SHG) by optically nonlinear crystals were selected for physical and chemical aspects, synthesized and subjected to preliminary tests. Promising materials were grown as single crystals of which the optical properties were measured and phase matching and acceptance properties were analyzed (spectral range 0.23 to 1 micron). Complete evaluations were carried out for 24 substances. Five substances are suitable for SHG from IR to visible, two for SHG from IR to near UV (N2H6SO4 and BaZnF4). For Ca2MgSi2O7 (Ni) extreme dichroism and a change in double refraction of 3 times 10 to the power-4/atom % Ni are found. For

21 polar crystals a complete set of optical dispersion coefficients is determined. Author (ESA)

N84-33515# Joint Publications Research Service, Arlington, Va.
FUSING CAPACITY OF CONCENTRATED LASER BEAM Abstract Only
a. I. Spripchenko and A. V. Surkov *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-006) 20 Aug. 1984 p 31 Transl. into ENGLISH from Svarochnoye Proizv. (Moscow), no. 5, May 1984 p 11-13 (For primary document see N84-33489 23-23)
Avail: NTIS HC A04/MF A01

N84-33983*# Technische Univ., Munich (West Germany).
LASER REMOTE SENSING MEASUREMENTS OF NATURAL TARGET REFLECTIVITIES
F. Lehamnn, W. Wiesemann (Battelle-Institut), M. Rother (Battelle Institut), and C. Werner (DFVLR) *In* ESA IGARSS 84 Remote Sensing: From Res. Towards Operational Use, Vol. 2 Aug. 1984 p 793-796 refs Sponsored by German Federal Ministry for Research and Technology (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 20E

N84-33984*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DEMONSTRATION OF AN ACTIVE AIRBORNE IR LASER SYSTEM FOR GEOLOGIC REMOTE SENSING
A. B. Kahle, M. S. Shumate, and D. B. Nash *In* ESA IGARSS 84 Remote Sensing: From Res. Towards Operational Use, Vol. 2 Aug. 1984 p 797-799 refs (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 20E

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N84-33807* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
IMPACTING DEVICE FOR TESTING INSULATION Patent
John W. Redmon, inventor (to NASA) Issued 11 Sep. 1984 10 p Filed 24 Jan. 1983
(NASA-Case-MFS-25862-2; NAS 1.71:MFS-25862-2; US-Patent-4,470,293; US-Patent-Appl-SN-460509; US-Patent-Class-73-12; US-Patent-Class-73-588) Avail: US Patent and Trademark Office CSCL 13I

An electro-mechanical impacting device for testing the bonding of foam insulation to metal is descirbed. The device lightly impacts foam insulation attached to metal to determine whether the insulation is properly bonded to the metal and to determine the quality of the bond. A force measuring device, preferably a load cell mounted on the impacting device, measures the force of the impact and the duration of the time the hammer head is actually in contact with the insulation. The impactor is designed in the form of a handgun having a driving spring which can propel a plunger forward to cause a hammer head to impact the insulation. The device utilizes a trigger mechanism which provides precise adjustements, allowing fireproof operation. NASA

N84-33808* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DIESEL ENGINE CATALYTIC COMBUSTOR SYSTEM Patent
Lloyd W. Ream, inventor (to NASA) Issued 22 May 1984 7 p Filed 6 Jun. 1980 Supersedes N80-26659 (18 - 17, p 2274)
(NASA-Case-LEW-12995-1; NAS 1.71:LEW-12995-1; US-Patent-4,449,370; US-Patent-Appl-SN-157150; US-Patent-Class-60-606; US-Patent-Class-60-303) Avail: US Patent and Trademark Office CSCL 20A

A low compression turbocharged diesel engine is provided in which the turbocharger can be operated independently of the engine to power auxiliary equipment. Fuel and air are burned in a catalytic combustor to drive the turbine wheel of turbine section which is initially caused to rotate by starter motor. By opening a flapper value, compressed air from the blower section is directed to catalytic combustor when it is heated and expanded, serving to drive the turbine wheel and also to heat the catalytic element. To start, engine valve is closed, combustion is terminated in catalytic combustor, and the valve is then opened to utilize air from the blower for the air driven motor. When the engine starts, the constituents in its exhaust gas react in the catalytic element and the heat generated provides additional energy for the turbine section. Official Gazette of the U.S. Patent and Trademark Office

N84-33809* Texas Univ., Austin.
THERMODYNAMIC ANALYSIS OF JOURNAL BEARINGS OPERATING UNDER STEADY STATE LOADING IN LAMINAR REGIME Ph.D. Thesis
Mansour Mohammadian Khonsari 1983 293 p
Avail: Univ. Microfilms Order No. DA8414398

Thermohydrodynamic effects in journal bearings operating under steady load in laminar regime are investigated. An analytical model for the finite and infinitely long journal bearings is formulated. The model includes correction factors for the cavitation effects in the unloaded region of the bearing and the mixing of the recirculating oil and supply oil at the oil inlet. A finite difference computer program is developed to numerically solve the governing equations of the continuity, Reynolds, energy, Laplace heat conduction, and a viscosity-temperature relation simultaneously. The program includes a numerical technique for obtaining an isothermal shaft temperature. The numerical results of temperature distribution and the heat effects on the bearing load carrying capacity agree closely with those of experimental findings. Several different sets of simpler boundary conditions for the energy equation are studied.
Dissert. Abstr.

N84-33810*# Battelle Columbus Labs., Ohio.
REVIEW OF LOX BEARING AND SEAL MATERIALS TESTER (BSMT) RADIAL LOAD SYSTEM Final Report
K. F. Dufrane and J. W. Kannel 28 Sep. 1984 83 p
(Contract NAS8-34908)
(NASA-CR-171162; NAS 1.26:171162) Avail: NTIS HC A05/MF A01 CSCL 13I

Problems concerning the bearings in the high pressure oxygen turbopumps (HPOTP) were investigated. The tasks involved: failure analyses, bearing dynamics calculations, lubrication studies, wear studies, and analyses of thermal transients. The radial load system on MSFC's bearing and seal tester used to study components for the HPOTP in liquid oxygen (LOX) is analyzed and the wear behavior of AISI 440C steel with polytetrafluoroethylene (PTFE) lubrication is studied. E.A.K.

N84-33811*# Rocketdyne, Canoga Park, Calif.
RESEARCH STUDY FOR EFFECTS OF CASE FLEXIBILITY ON BEARING LOADS AND ROTOR STABILITY Final Report
J. R. Fenwick and R. B. Tarn 31 Aug. 1984 255 p
(Contract NAS3-34964)
(NASA-CR-171147; NAS 1.26:171147; RI/RD84-191) Avail: NTIS HC A12/MF A01 CSCL 13K

Methods to evaluate the effect of casing flexibility on rotor stability and component loads were developed. Recent Rocketdyne turbomachinery was surveyed to determine typical properties and frequencies versus running speed. A small generic rotor was run with a flexible case with parametric variations in casing properties for comparison with a rotor attached to rigid supports. A program for the IBM personal computer for interactive evaluation of rotors and casings is developed. The Root locus method is extended for use in rotor dynamics for symmetrical systems by transforming all motion and coupling into a single plane and using a 90 degree criterion when plotting loci. E.A.K.

N84-33812# Department of the Air Force, Washington, D.C.
CONSTANT SPEED DRIVE WITH COMPENSATION USING DIFFERENTIAL GEARS Patent Application
B. E. Franz, inventor (to Air Force) Filed 18 Apr. 1984 33 p

(AD-D011156; US-Patent-Appl-SN-601514) Avail: NTIS HC A03/MF A01 CSCL 10/2

The electrical supply system on aircraft may employ a constant speed drive (CSD) to convert variable engine speed to constant speed for operation of synchronous 400 Hz electrical generators. The heart of these devices is a differential which mechanically sums the input of two shafts and outputs this sum to a third shaft. Connected to this third shaft is a constant speed synchronous generator. Connected to one of the input shafts is the turbine generator (most likely through gearing). The second input shaft is connected to a speed compensating drive which accounts for engine speed changes. The speed compensating device disclosed herein is an electrically compensating motor/generator arrangement. Bidirectional power flow in the electric compensation link uses two high-speed, permanent-magnet, three-phase machines inter-connected by a power conditioning network. One machine is operated as a brushless dc machine, while the other functions as a variable speed synchronous machine. Steady-state performance of two types of power conditioning are presented--a dc link inverter and a cycloconverter link.

Author (GRA)

N84-33813# Department of the Air Force, Washington, D.C.

HARNESS FORMATION END-EFFECTOR WITH INTERCHANGEABLE TOOL CAPABILITY Patent Application

M. Weixel, inventor (to Air Force) Filed 30 May 1984 11 p

(AD-D011168; US-Patent-Appl-SN-615506) Avail: NTIS HC A02/MF A01 CSCL 09/3

A harness formation end-effector comprising a housing disposed for cooperable receipt and retention of a removable tool tip, wherein the tool tip may take the form of a contact insertion tool tip or a crimping tool tip or the like.

Author (GRA)

N84-33814# Argonne National Lab., Ill. Components Technology Div.

THERMODYNAMIC ANALYSIS OF MULTICOMPONENT WORKING FLUIDS FOR RANKINE BOTTOMING CYCLE APPLICATIONS

J. E. Ash Jan. 1984 103 p

(Contract W-31-109-eng-38)

(DE84-014843; ANL-84-17) Avail: NTIS HC A06/MF A01

The basic equations underlying a computer code are developed to describe the thermodynamic behavior or multicomponent working fluids in Rankine cycles. The code is to be employed in the performance analysis of Rankine bottoming cycle systems. The performance of such systems depends strongly on the working fluid characteristics. The introduction of multicomponent mixtures makes available a broad spectrum of fluid properties achievable by varying the mixture composition. The code provides a tool to analytically vary the mixture composition to optimize cycle performance.

DOE

N84-33815# Department of Energy, Washington, D. C.

FLOW METERING VALVE Patent Application

Kenneth L. Blaedel, inventor (to DOE) Filed 3 Nov. 1983 18 p

(Contract W-7405-eng-48)

(DE84-014249; US-Patent-Appl-SN-548280) Avail: NTIS HC A02/MF A01

An apparatus for metering fluids at high pressures of about 20,000 to 60,000 psi is disclosed. The apparatus includes first and second plates which are positioned adjacent each other to form a valve chamber. The plates are made of materials which have substantially equal elastic properties. One plate has a planar surface area, and the other a recessed surface area defined by periphery and central lips. When the two plates are positioned in adjacent contacting relationship, a valve chamber is formed between the planar surface area and the recessed surface area. Fluid is introduced into the chamber and exits therefrom when a deformation occurs at positions where they no longer form a valve seat. This permits the metering of fluids at high pressures and at slow variable rates. Fluid then exits from the chamber until an applied external force becomes large enough to bring the valve seats back into contact.

DOE

N84-33816# Kernforschungsanlage, Juelich (West Germany). Zentralabteilung Allgemeine Technologie.

LIFE TESTS OF BALL BEARINGS AT 120C IN HELIUM ATMOSPHERE [LEBENSDAUERVERSUCHE AN KUGELLAGERN BEI 120 C IN HELIUM-ATMOSPHAERE]

H. Haas Apr. 1984 108 p refs In GERMAN; ENGLISH summary Original contains color illustrations

(JUEL-1911; ISSN-0366-0885) Avail: NTIS HC A06/MF A01

Basic principles of tribology in helium were compiled and 40 ball bearings were tested at 90 and 120 C in helium. Applied loads comply with the usual values in machine construction. Results show that ball bearings can be produced by exchanging the cages of standardized bearings. Ten million power revolutions are obtained even for soft metals such as lead bronze, suitable in a radiation environment. The suitability of lubricants was also tested.

Author (ESA)

N84-33817# Maschinenfabrik Augsburg-Nuernberg A.G., Munich (West Germany).

ENHANCED EFFICIENCY OF MODERN FOUR-STROKE DIESEL ENGINES IN GENERATOR OPERATION [STEIGERUNG DER WIRTSCHAFTLICHKEIT MODERNER VIERTAKT-DIESELMOTOREN IM GENERATORBETRIEB]

Rolf Schmuch 1984 21 p In GERMAN Presented at Rahmen der Fachschau Energie der Hannover Messe 1984, Hanover, 1984

Avail: NTIS HC A02/MF A01

Measures to increase diesel engine efficiency for continuous operation in the power range between 400 and 1600 kW and the speed range between 1000 and 400 rpm are presented. The effects of fuel consumption, heavy fuel oil operation, waste heat utilization, mechanical efficiency, lubricating oil consumption, lifetime of the essential motor components, and maintenance friendliness are reviewed.

Author (ESA)

N84-33818# Staiger, Mohilo G.m.b.H., Schorndorf (West Germany).

CONTROL AND SUPERVISION OF NUT FASTENING BY MEANS OF A MICROCOMPUTER Final Report, Dec. 1982

Eberhard Mayer and Ulrich Burger Bonn Bundesministerium fuer Forschung und Technologie Jun. 1984 46 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-T-84-106; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 8,50

A control unit for automatic nut fasteners was investigated. It has an electrically driven motor wrench of which torque and angle are measured, handled and stored by a microprocessor. The control unit switches off the motor at predetermined values. During the fastening process the torque-angle curve is compared with a nominal curve given by the user or statistically extracted from several tested devices. A good trace may not leave the tolerance band at any point. Place and direction of a deviation permit diagnosis and localization of faults.

Author (ESA)

N84-33819# Draegerwerk A.G., Luebeck (West Germany).

DEVELOPMENT OF AN ELECTRICALLY CONTROLLABLE GAS FLOW VALVE FOR USE IN PATIENT VENTILATORS Final Report, Oct. 1981

Heye Harms, Eric Hecker, and Ulrich Heim Bonn Bundesministerium fuer Forschung und Technologie Jun. 1984 34 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-T-84-129; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 7

Electrically controllable flow valves were developed for microprocessor controlled artificial respirators. The system has a dynamic range of 1:100, a high cutoff frequency, and excellent linearity and reproductibility. The combination of these features is obtained by using a ball valve with electrodynamic drive. Flow control is achieved by controlling the opening distance of the

valve. For this purpose, a fast and stable distance transducer was developed. Variations on the high pressure side of the valve are measured by a pressure transducer and corrected via the electronics of the valve control circuit. Author (ESA)

N84-33820# National Centre of Tribology, Risley (England). European Space Tribology Lab.
TORQUE PROPERTIES OF OSCILLATING, DRY-LUBRICATED BALL BEARINGS IN VACUUM
C. White and M. J. Todd Paris ESA Sep. 1983 14 p ref
(Contract ESTEC-4099/79/NL-PP)
(ESA-ESTL-57; ESA-CR(P)-1890) Avail: NTIS HC A02/MF A01

Torque and wear characteristics of ion plated lead, RF sputtered MoS2 and PTFE were compared in ball bearings in vacuum, subjected to oscillation through fixed or randomly varied angles. Ion-plated lead and sputtered MoS2 operate well in oscillated, hard-preloaded, high precision bearings. Both are satisfactory in many limited cycle usages, but for minimum average torque level and minimum torque noise, the sputtered MoS2 is preferable. Transfer films from PTFE composite yield unstable, speed-sensitive torque behavior. Unless the speed is kept low enough the torque/time curve shows a rising torque whose gradient increases with speed. Author (ESA)

N84-33512# Joint Publications Research Service, Arlington, Va.
BONDING MATERIALS BY GAS-PHASE PRECIPITATION Abstract Only
V. K. Sokolov, Yu. M. Korolev, V. V. Frolov, V. I. Stolyarov, and V. F. Solovyev *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-006) 20 Aug. 1984 p 29 Transl. into ENGLISH from Tsvetn. Metal. (Moscow), no. 5, May 1984 p 88-91 (For primary document see N84-33489 23-23)
Avail: NTIS HC A04/MF A01

N84-33513# Joint Publications Research Service, Arlington, Va.
CERTAIN FEATURES OF LASER WELDING WITH PENETRATING MELTING Abstract Only
A. I. Skripchenko, A. V. Surkov, and V. V. Bashenko *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-006) 20 Aug. 1984 p 29-30 Transl. into ENGLISH from Svarochnoy Proizv. (Moscow), no. 5, May 1984 p 14-16 (For primary document see N84-33489 23-23)
Avail: NTIS HC A04/MF A01

N84-33514# Joint Publications Research Service, Arlington, Va.
NARROW-SEAM LASER WELDING OF COMPONENTS OF LOW THICKNESS Abstract Only
G. I. Levin *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-006) 20 Aug. 1984 p 30 Transl. into ENGLISH from Svarochnoy Proizv. (Moscow), no. 5, May 1984 p 13-14 (For primary document see N84-33489 23-23)
Avail: NTIS HC A04/MF A01

N84-33516# Joint Publications Research Service, Arlington, Va.
INCREASING FUSION EFFICIENCY IN LASER WELDING WITH DYNAMIC BEAM FOCUSING Abstract Only
V. V. Ivanov, V. V. Baykov, A. G. Grigoryants, and I. N. Shiganov *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-006) 20 Aug. 1984 p 31 Transl. into ENGLISH from Svarochnoye Proizv. (Moscow), no. 5, May 1984 p 9-11 (For primary document see N84-33489 23-23)
Avail: NTIS HC A04/MF A01

N84-33517# Joint Publications Research Service, Arlington, Va.
CERTAIN METALLURGICAL PROPERTIES OF LASER WELDING Abstract Only
A. V. Surkov and N. M. Novozhilov *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-006) 20 Aug. 1984 p 32 Transl. into ENGLISH from Svarochnoye Proizv. (Moscow), no. 5, May 1984 p 8-9 (For primary document see N84-33489 23-23)
Avail: NTIS HC A04/MF A01

N84-33624# Joint Publications Research Service, Arlington, Va.
VERSATILITY OF NEW EAST, WEST EUROPEAN ROBOTS VIEWED
In its USSR Rept.: Machine Tools and Metalworking Equipment (JPRS-UMM-84-016) 6 Sep. 1984 p 33-37 Trans. into ENGLISH from Nauki i Zhizn (Moscow), no. 11, Nov. 1983 p 58-63 (For primary document see N84-33623 23-31)
Avail: NTIS HC A04/MF A01

N84-33625# Joint Publications Research Service, Arlington, Va.
KIROV'S PLANT TROUBLES WITH ROBOTIZATION
V. Zenkovskiy *In its* USSR Rept.: Machine Tools and Metalworking Equipment (JPRS-UMM-84-016) 6 Sep. 1984 p 38-42 Transl. into ENGLISH from Sots. Industr. (Moscow), 29 Apr. 1984 p 2 (For primary document see N84-33623 23-31)
Avail: NTIS HC A04/MF A01

N84-33626# Joint Publications Research Service, Arlington, Va.
ADMINISTRATIVE OBSTACLES TO ROBOTIZATION RECALLED
S. Pochin *In its* USSR Rept.: Machine Tools and Metalworking Equipment (JPRS-UMM-84-016) 6 Sep. 1984 p 43-47 Transl. into ENGLISH from Lenigr. Pravda (Leningrad), 1 Jun. 1984 p 2 (For primary document see N84-33623 23-31)
Avail: NTIS HC A04/MF A01

N84-33627# Joint Publications Research Service, Arlington, Va.
ROBOTIZATION OF STAMPING OPERATION REVIEWED
A. Valentinov *In its* USSR Rept.: Machine Tools and Metalworking Equipment (JPRS-UMM-84-016) 6 Sep. 1984 p 48-51 Transl. into ENGLISH from Sots. Industr. (Moscow), 29 May 1984 p 2 (For primary document see N84-33623 23-31)
Avail: NTIS HC A04/MF A01

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N84-33821# Southern Methodist Univ., Dallas, Tex.
STATISTICAL ANALYSES FOR NONDESTRUCTIVE TESTING Technical Report, 1 Jan. - 31 Dec. 1983
D. B. Owen 18 Jul. 1984 14 p
(Contract N00014-84-K-0146)
(AD-A143668; SMU-2-200-84) Avail: NTIS HC A02/MF A01 CSCL 12/1

A statistical method is developed for making an inference about a performance variate based on an observation of a screening variate. This is the typical situation in nondestructive testing where to measure the variable or primary interest would destroy or degrade the item under study. Typically the performance variable is lifetime. The non-destructive testing engineer must look at other related variables and based upon some mathematical analysis and engineering judgments, decide if the item can meet the minimum lifetime requirements. Author (GRA)

N84-33498# Joint Publications Research Service, Arlington, Va.
DEFORMABILITY AND BEARING STRENGTH OF SHELLS MADE ON RELEASE MANDREL Abstract Only
V. S. Pichugin, V. D. Protasov, and Ye. I. Stepanychev *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-006) 20 Aug. 1984 p 8 Transl. into ENGLISH from Mekhan. Kompozitnykh Materialov (Riga), no. 2, Mar. - Apr. 1984 p 279-282 (For primary document see N84-33489 23-23)
Avail: NTIS HC A04/MF A01

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance.*

N84-33822 Polish Academy of Sciences, Warsaw.
MULTICRITERION OPTIMIZATION OF CONSTRUCTION [OPTIMALIZACJA WIELOKRYTERIALNA KONSTRUKCJI]
Stefan Jendo and Wojciech Marks 1983 53 p refs
(ISSN-0208-5658) Copyright. Avail: Issuing Activity

Multicriterion optimization theory is formulated mathematically for use in structural design. The basic concepts involved in the formulation of problems of multicriterion optimization include: decision variables, restrictions on permissible solutions, and the mathematical expression of structural design properties. Static and dynamic polyoptimization are distinguished. The ideal solution of a multicriterion optimization problem states the extremes of each objective function simultaneously. The use of Pareto optima in structural design is discussed; compromise solutions and domination structures also are reviewed. The various methods of designating a set of compromises are described, including the method of weight coefficients. Author

N84-33823 Polish Academy of Sciences, Warsaw.
THE EFFECT OF THERMOMECHANICAL COUPLING IN THE CASE OF A THICK-WALL SPHERE AND TUBE SUBJECTED TO INTERNAL PRESSURE [EFEKT SPRZEZENIA TERMOMECHAICZNEGO W PRZYPADKU GRUBOSCIENNEJ KULI I RURY OBCIAZONYCH CISNIENIEM WEWNETRZNYM]
Z. Sloderbach and T. Sawicki 1983 44 p refs In POLISH
(ISSN-0208-5658) Copyright. Avail: Issuing Activity

An analytic solution is provided to illustrate the effect of thermomechanical coupling with particular reference to an elastic-plastic, thick-walled circular cylindrical tube subjected to internal pressure. The effect of thermal expansion, caused by the dissipation of the power of plastics deformation, on stresses, deformation, and temperature imposed by internal pressure and on additional stresses remaining in a thick-walled sphere and tube after the removal of internal pressure is analyzed. The applied internal pressure increases quasistatistically. Three specific aspects of the loading problem are examined: coupled thermoplasticity with and without consideration of the hidden energy of plastic deformation, and uncoupled thermoplasticity. Author

N84-33824 Case Western Reserve Univ., Cleveland, Ohio.
ON STRESS ANALYSIS OF A CRACK-LAYER Ph.D. Thesis
Alexander Dolgopolsky 1984 130 p
Avail: Univ. Microfilms Order No. DA8414059

This work considers the problem of elastic interaction of a macrocrack with an array of microcracks in the vicinity of the macrocrack tip. Using the double layer potential techniques, the solution to the problem within the framework of the plane problem of elastostatics was obtained. Three particular problems of interest to fracture mechanics were analyzed. It follows from the analysis that microcrack array can either amplify or reduce the resulting stress field of the macrocrack-microcrack array system depending on the array's configuration. Using the obtained elastic solution, the energy release rate associated with the translational motion of the macrocrack-microcrack array system was evaluated. Dissert. Abstr.

N84-33825 Case Western Reserve Univ., Cleveland, Ohio.
COLLAPSE OF LONG STIFFENED CIRCULAR CYLINDERS UNDER COMBINED AXIAL BENDING AND PRESSURE LOADING Ph.D. Thesis
James Daniel McAleese 1984 181 p
Avail: Univ. Microfilms Order No. DA8414062

The collapse of long stiffened circular cylinders under pressure and bending loads is investigated. The set of eight first order nonlinear partial differential equations is developed. The solution procedure assumes a fourier series in the circumferential direction and a finite difference distribution along the length. The computer code NONLINC is developed to solve these equations. Because of computer storage limitations NONLINC is restricted to the nonlinear response calculations and does not consider buckling from this configuration. The nonlinear response, including ovaling, is generated for stiffened and unstiffened cylinders under the action of bending and pressure loading and data is presented to guide ring design. Dissert. Abstr.

N84-33826 Carnegie-Mellon Univ., Pittsburgh, Pa.
THREE-DIMENSIONAL FINITE ELEMENT ANALYSIS OF STRAIGHT AND CURVED THROUGH CRACKS IN A PLATE Ph.D. Thesis
Joseph Stanley Solecki 1984 155 p
Avail: Univ. Microfilms Order No. DA8414752

A three dimensional analysis of a plate containing a centrally located, through crack is given. The plate is taken to behave in a linear elastic manner under static tension applied in a direction normal to the crack plane. Both straight and curved crack front problems are investigated. Numerical results are obtained using the finite element method. Special solid elements are devised to admit the representation of a stress singularity that varies along a three dimensional crack front. A model is developed to resolve considerable detail of the field variables in the vicinity of the crack front and in the vicinity of the vertex. The profile of the crack front is initially taken to be straight, and the distribution of the energy release rate is calculated via a stiffness derivative method. The stress and displacement distributions are investigated and compared to familiar, planar theories. Plate thickness effects are also studied. In passing from straight to curved crack front configurations, changes in the vertex singularity and in the field variables are also addressed. Dissert. Abstr.

N84-33827 Minnesota Univ., Minneapolis.
RAPID DETERMINATION OF UPPER AND LOWER BOUNDS TO BUCKLING LOADS AND NATURAL FREQUENCIES OF NON-UNIFORM BARS Ph.D. Thesis
Mohammad Jasem Alostaz 1984 101 p
Avail: Univ. Microfilms Order No. DA8413749

A method of obtaining upper and lower bounds to the eigenvalues of Sturm-Liouville systems and to the buckling loads and natural frequencies of non-uniform linearly-elastic bars is presented. The method is based on a general series-solution to second and fourth-order Sturm-Liouville problems to arrive at the eigenvalue equation which has the form of an alternating power-series set equal to zero. Truncation and approximate representation of that power series by (any) one of its leading polynomials yield lower and upper-bound estimates to a number of leading eigenvalues. One of the advantages of the method is that it requires no initial assumptions regarding the eigenfunctions in order to yield its bound estimates. For providing a lower bound to the first eigenvalue, the method is believed to be the most efficient available. In providing bounds to higher eigenvalues, the method is not necessarily as efficient as some existing methods. A scheme is developed for obtaining a general expression for the frequency equation for the free axial-vibration of an n-segment piecewise-uniform linearly-elastic bar which is either fixed or free at least end. Dissert. Abstr.

N84-33828 Carnegie-Mellon Univ., Pittsburgh, Pa.
SOME INHERENTLY 3-DIMENSIONAL PROBLEMS IN LINEAR ELASTIC FRACTURE MECHANICS Ph.D. Thesis
William Scott Burton 1984 87 p
Avail: Univ. Microfilms Order No. DA8414735

Some elastic configurations containing cracks under transverse tension which intersect a free surface are investigated. A numerical treatment of a set of integral equations is considered here. A numerical convergence check and a comparison with a finite element treatment of a companion geometry provide confidence in the results found which focus on the key quantity in linear elastic fracture mechanics (LEFM), the energy release rate, G. The effect of the free surface/crack intersection in the basic configuration considered here is found to be small in the context

of LEFM. This effect is found to be greater in configurations containing presumed compressive near-surface residual stresses, indicating possible merit in their further investigation.
Dissert. Abstr.

N84-33829 Akron Univ., Ohio.
EXTENSION OF CONSTRAINED INCREMENTAL NEWTON RAPHSON METHODOLOGIES TO HANDLING GENERALIZED THERMOMECHANICAL LOADING FIELDS Ph.D. Thesis
Shantaram Subrao Pai 1984 194 p
Avail: Univ. Microfilms Order No. DA8414650

Numerical strategies which enable the constrained incremental Newton-Raphson scheme to handle the static response of structure to loading fields with completely generalized histories are developed. This is made possible through the use of specially warped hyperelliptic constraint surfaces which control successive or clustered load steps in the vicinity of loading events with specific timing and schedules. Solution strategy which enables handling the positive/indefinite stiffness characteristics associated with the pre and post buckling of structures subject to complex thermomechanical loading fields is developed. Situations involving nonlinear kinematics as well as highly dependent elastic plastic and thermoelastic plastic material behavior are included. To demonstrate the scheme, the numerical strategies were implemented into the finite element programs, ADINA and ADINAT. The results of several benchmark problems which illustrate the capabilities of the scheme to handle varying types of nonlinear behavior are presented. Dissert. Abstr.

N84-33830 California Univ., Berkeley.
MECHANICAL RESPONSE OF CERAMICS TO CREEP LOADING Ph.D. Thesis
William Richard Blumenthal 1983 98 p
Avail: Univ. Microfilms Order No. DA8413317

The mechanical response of small, semi-elliptical, indentation-indiced surface cracks in fine-grain alumina is studied. The deformation behavior of a crack tip region is monitored using crack opening and surface displacements. Results indicate values of the secondary creep exponent, n, between 1.5 and 2 with a temperature dependence consistent with secondary creep data from the same material. Crack growth is measured at 1300 C and 1400 C and a narrow power-law growth regime is revealed. Again the power-law exponent and activation energy were very close to creep values Crack tip damage in the form of grain boundary cavities growing by diffusion is responsible for crack extension. The crack growth theshold is preceded by a transition in the size and distribution of damage. Near K(th) damage concentrates in side-lobes far ahead of the crack tip and at angles beween 20 to 60 degrees from the plane of the crack. The transition between frontal and side-lobe damage is anticipated to be moderately dependent on grain size. Dissert. Abstr.

N84-33831 California Univ., Berkeley.
MECHANICS OF MICROCRACK TOUGHENING IN CERAMICS Ph.D. Thesis
Yen Fu 1983 122 p
Avail: Univ. Microfilms Order No. DA8413386

A theoretical analysis of the mechanics of microcrack toughening, parallel to that conducted by Budiansky, et al, for transformation toughening, is conducted, whereupon the basis of these unique features are established. During unloading, a linear strain response resumes and a hysteresis derives from the irreversible cycle, which corresponds to a strain energy dissipation mode. The microstructural configuration for the onset of microcrack toughening originates from the nucleation of discrete microcracks. The calculations of the residual stress fled around the primary crack show perferential orientations and sites for discrete microcrack formation. The driving force for such a cracking system is compared with that of primary crack extension to determine the onset configuration. The fracture energies at the initiation of crack propagation subject to a frontal microcrack zone and at the steady state cracking stage subject to an extended microcrack zone are calculated, corresponding to the two extremities on the R-curve. It is found that the toughening effect derives from the nonlinear characteristics of the microcrack zone; specifically, the R-curve originates from the hysteresis associated with the gradual unloading of the microcrack zone wake. Dissert. Abstr.

N84-33832*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A FORMULATION OF ROTOR-AIRFRAME COUPLING FOR DESIGN ANALYSIS OF VIBRATIONS OF HELICOPTER AIRFRAMES
Raymond G. Kvaternik and William C. Walton, Jr. Jun. 1982 135 p refs
(NASA-RP-1089; L-14243; NAS 1.61:1089) Avail: NTIS HC A07/MF A01 CSCL 01C

A linear formulation of rotor airframe coupling intended for vibration analysis in airframe structural design is presented. The airframe is represented by a finite element analysis model; the rotor is represented by a general set of linear differential equations with periodic coefficients; and the connections between the rotor and airframe are specified through general linear equations of constraint. Coupling equations are applied to the rotor and airframe equations to produce one set of linear differential equations governing vibrations of the combined rotor airframe system. These equations are solved by the harmonic balance method for the system steady state vibrations. A feature of the solution process is the representation of the airframe in terms of forced responses calculated at the rotor harmonics of interest. A method based on matrix partitioning is worked out for quick recalculations of vibrations in design studies when only relatively few airframe members are varied. All relations are presented in forms suitable for direct computer implementation. E.A.K.

N84-33833# Aeronautical Research Labs., Melbourne (Australia).
ANALYSIS OF THE DOUBLE OVERLAP FATIGUE SPECIMEN
J. Paul and R. Jones 1984 12 p refs
(ARL/STRUC-Rept-402; AR-003-016) Avail: NTIS HC A02/MF A01

An analogy was proposed between the behavior of a bonded overlap joint and a bonded repair. The behavior of the fiber and the adhesive stresses in a bonded overlap joint are examined and the results of previous one-dimensional analyses of the problem are invalid in the vicinity of the gap in the specimen. The fiber and adhesive stresses are also shown to be strongly dependent on the gap size. Author

N84-33834*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A REVIEW OF CHEVRON-NOTCHED FRACTURE SPECIMENS
J. C. Newman, Jr. Sep. 1984 54 p refs
(NASA-TM-85797; NAS 1.15:85797) Avail: NTIS HC A04/MF A01 CSCL 20K

The historical development of chevron notched fracture specimens is reviewed. Stress intensity factors and load line displacement solutions proposed for some of these specimens are compared. The original bend bar configurations up to the present day short rod and bar specimens are reviewed. The results of an analytical round robin that was conducted on chevron-notched specimens are presented. In the round robin, stress-intensity factors for either the chevron notched round rod or square bar specimens were calculated. The consensus stress intensity factor (compliance) solution for these specimens is assessed. The stress intensity factor solutions proposed for three and four point bend chevron notched specimens are reviewed. E.A.K.

N84-33835*# Stanford Univ., Calif. Dept. of Aeronautics and Astronautics.
REFINED METHODS OF AEROELASTIC ANALYSIS AND OPTIMIZATION Progress Reports, Feb. - Sep. 1984
Holt Ashley Sep. 1984 24 p refs
(Grant NGL-05-020-243)
(NASA-CR-173967; NAS 1.26:173967) Avail: NTIS HC A02/MF A01 CSCL 20K

Graduate research activity in the following areas is reported:

the divergence of laminated composite lifting surfaces, subsonic propeller theory and aeroelastic analysis, and cross sectional resonances in wind tunnels. R.S.F.

N84-33836# Forest Products Lab., Madison, Wis.
HOW SOME TEST VARIABLES AFFECT BENDING, TENSION, AND COMPRESSION VALUES FOR PARTICLE PANEL PRODUCTS
J. D. McNatt and M. J. Superfesky Jul. 1984 11 p
(AD-A143627; FSRP-FPL-446) Avail: NTIS HC A02/MF A01 CSCL 11/12

Three different particle panel products-particleboard, waferboard, and alined flakeboard (lab-made)--were tested in bending, tension, and compression to evaluate the effects of various test conditions and specimen sizes on strength and stiffness. Standard ASTM-size bending specimens were loaded at midspan or at the quarter points. There were no substantial differences between the two loading methods in average modulus of rupture or modulus of elasticity (MOE) values obtained for any of the three products. Doubling the length and width of the standard compression parallel-to-surface specimen and laminating two thicknesses together resulted in increased compressive strength and MOE values. Increasing the length of the necked-down portion of the standard tension parallel-to-surface specimen from 2 to 6 inches and using a 6-inch rather than a 2-inch gage length did not affect MOE values but did give somewhat lower tensile strength values. Author (GRA)

N84-33837# Naval Postgraduate School, Monterey, Calif.
EFFECT OF BOUNDARY CONDITIONS ON THE DAMPING CHARACTERSTICS OF A RANDOMLY EXCITED CAST NICKEL-ALUMINUM BRONZE SPECIMEN AT LOW STRESS LEVELS M.S. Thesis
S. T. Knouse Mar. 1984 159 p
(AD-A143685) Avail: NTIS HC A08/MF A01 CSCL 20/11

This research examines how various specimen and support arrangements affect a material's damping characteristics. The 74 lb. sample studied is cast nickel-aluminum bronze and measures 19.8 x 13.65 x 1 inches. Using previously documented Naval Postgraduate School research, desired random vibration analysis has been verified by impulse hammer techniques. Input excitation is generator system and response is recorded through the use of piezoelectric accelerometers. The frequency range studied varies from 100 Hertz to 12,5000 Hertz. The vibration generator is threaded into the specimen and the accelerometers are attached to the machined surface of the sample with a cyanoacry-late adhesive. Boundary support conditions include various foam bolted and shock-cord configurations. GRA

N84-33838# Dayton Univ., Ohio.
EVALUATION OF COD (CRACK-OPENING-DISPLACEMENT) COMPLIANCE DETERMINED CRACK GROWTH RATES Interim Report, Nov. 1981 - Jan. 1983
D. C. Maxwell, J. P. Gallagher, and N. E. Ashbaugh Wright-Patterson AFB, Ohio AFWAL Jun. 1984 59 p
(Contract F33615-81-C-5015)
(AD-A144037; AFWAL-TR-84-4062) Avail: NTIS HC A04/MF A01 CSCL 11/6

Fatigue crack growth rate studies were conducted on sixteen X7091 aluminum specimens. Crack growth rates were determined by visual crack length measurements and crack-opening-displacement (COD) compliance measurement. The curves of crack growth rate versus stress intensity factor from COD compliance measurements were compared to the optical crack growth rate results which were determined by following ASTM E647 Standard Test Method for Constant-Load-Amplitude Fatigue Crack Growth Rates Above 10 to the 8th power m/Cycle. Differences between the growth rates from the two methods are discussed in terms of potential errors in the evaluation of variables used in the data collection and analysis. The use of handbook elastic modulus value has been found to be a source of significant error. The use of an effective modulus value calculated from the initial visual crack length is recommended. Author (GRA)

N84-33839# Department of Energy, Washington, D. C.
FLEXURAL SUPPORT MEMBER HAVING A HIGH RATIO OF LATERAL-TO-AXIAL STIFFNESS Patent Application
Wendall M. B. Maas, inventor (to DOE) Filed 23 Jun. 1983 13 p
(Contract DE-AC05-76OR-02908)
(DE84-011104; US-Patent-Appl-SN-507189) Avail: NTIS HC A02/MF A01

A convoluted flexible support structure is provided which is capable of supplying a lateral to axial spring rate in excess of 1000 to 1. A support member in the form of a steel disc having a specified number of rather large radius, concentric convolutions and a thickness in the range of from about 0.01 to 0.02 inch has an axial stiffness of about 50 pounds/inch while the lateral stiffness is about 100,000 pounds/inch. The support member may be used to support a vibration device where the lateral motion of the vibrator must be highly restricted while providing relatively free axial displacement of about + or - 0.25 inch. DOE

N84-33840# Argonne National Lab., Ill. Components Technology Div.
DYNAMIC CHARACTERISTICS OF HEAT EXCHANGER TUBES VIBRATING IN A TUBE SUPPORT PLATE INACTIVE MODE
J. A. Jendrzejczyk Jun. 1984 87 p refs
(Contract W-31-109-eng-38)
(DE84-014844; ANL-84-39) Avail: NTIS HC A05/MF A01

Tubes in shell and tube heat exchangers, including nuclear plant steam generators, derive their support from longitudinally positioned tube support plates (TSPs). Typically there is a clearance between the tube and TSP hole. Depending on design and fabrication tolerances, the tube may or may not contract all of the TSPs. Non-contact results in an inactive TSP which possibly leads to detrimental flow induced tube vibrations under certain conditions dependent on the resulting tube-TSP interaction dynamics and the fluid excitation forces. The tube-TSP interaction dynamics were investigated. Results of an experimental study of damping and natural frequency as functions of tube-TSP diametral clearance and TSP thickness are reported. Calculated values of damping ratio and frequency of a tube vibrating within an inactive TSP are also presented together with a comparison of calculated and experimental quantities. DOE

N84-33841# Department of Energy, Washington, D. C.
METHOD AND APPARATUS FOR MEASURING SHEAR MODULUS AND VISCOSITY OF A MONOMOLECULAR FILM Patent Application
Bernard M. Abraham, Kenjiro Miyano, and John B. Ketterson, inventors (to DOE) Filed 18 Oct. 1983 14 p
(DE84-014502; US-Patent-Appl-SN-542957) Avail: NTIS HC A02/MF A01

Apparatus for measuring the shear modulus of a monomolecular film is described that comprises a circular trough having inwardly sloping sides containing a liquid for supporting the monolayer on the surface thereof. A circular rotor is suspended above the trough such that the lower surface of the rotor contacts the surface of the liquid, and is positioned such that the axis of the rotor is concentric with the axis of the trough and freely rotable about its axis. A means of hydrostatically compressing the monolayer in the annular region formed between the rotor and the sides of the trough as well as a means for rotating the trough about its axis is presented. Preferably, hydrostatic compression of the monolayer is achieved by removing liquid from the bottom of the trough (decreasing the surface area) while raising the trough vertically along its axis to maintain the monolayer at a constant elevation (and maintain rotor contact). In order to measure viscosity, a means for rotating the rotor about its axis is added to the apparatus. DOE

42 GEOSCIENCES (GENERAL)

N84-33842# Hokkaido Univ., Sapporo (Japan). Inst. of Low Temperature Science.

DATA REPORT. LOW TEMPERATURE SCIENCE. SERIES A: PHYSICAL SCIENCES
1983 73 p refs In JAPANESE and ENGLISH
(ISSN-0385-3683) Avail: NTIS HC A05/MF A01

The topics included in Data Report in Low Temperature Science are the following: cross-sectional observation of snow cover in Sapporo in the winter of 1982-83; snow cover observation at Avalanche Research Station in northern Hokkaido in the winter of 1982-83 with wind speed and wind direction recordings; radiation measurement of snowy season in Sapporo, 1982-83; distribution of pack ice off Okhotsk sea coast of Hokkaido observed with sea ice radar network, January-April, 1983; and basic program for microcomputer to analyze and process outdoor observation data. For individual titles, see N84-33843 through N84-33847.

N84-33843# Hokkaido Univ., Sapporo (Japan).
REPORT OF PIT-WALL OBSERVATIONS OF SNOW COVER IN SAPPORO, 1982 - 1983 **c43**
Yasoich Endo and Eizi Akitaya *In its* Data Rept. Low Temp. Sci. Ser. A: Phys. Sci. 1983 p 1-7 In JAPANESE (For primary document see N84-33842 23-42)
Avail: NTIS HC A05/MF A01

The results of cross-sectional observations of snow cover conducted in the backyard of the Institute of Low Temperature Science, Hokkaido University in the winter of 1982 to 83 are reported. Similar observations were made every year since 1963. The methods and the list of items for observation remain the same. Snow depth cm, density g/cm(3), hardness g/cm(2), snow temperature C, water content (W)% are shown in the first chart. Different layers of snow are illustrated, including new snow semi-packed snow, packed snow, tinted layer, ice sheet, granulated snow, semi-bottom granulated snow and bottom granulated snow, in that order. Snow depth, snow quality, and size of snow flake also are indicated. The maximum and minimum temperatures at the site of observation and snow accumulation in the winter of 1982 to 83 are plotted. Transl. by B.G.

N84-33844# Hokkaido Univ., Sapporo (Japan).
SNOW COVER OBSERVATIONS AT AVALANCHE RESEARCH STATION, TOIKANBETSU, NORTHERN HOKKAIDO, 15 (1982-1983 WINTER) **c43**
Tosio Huzioka, Hiromu Shimizu, Eizi Akitaya, Hideki Narita, and Mitsuo Ohizumi *In its* Data Rept. Low Temp. Sci. Ser. A: Phys. Sci. 1983 p 9-23 refs In JAPANESE (For primary document see N84-33842 23-42)
Avail: NTIS HC A05/MF A01

The results of snow cover observations at Avalanche Research Station in Northern Hokkaido in the winter of 1982 to 83 are present. Observations were conducted at northern (D) and southern (S-1) experimental slopes. Since the mode of snow accumulation, snow quality, and occurrence of avalanche were greatly influenced by the wind, an anemometer and a weather vane were installed on the roof top above the experimental slopes. The snow cover observations included depth of snow, stratification, snow temperature, type of snow at each stratum, density, and hardness of snow, and size of snow flakes. Maximum, minimum, and average temperature between Dec. 9, 1982 and March 31, 1983 are shown. The direction and speed of wind during this period also are shown. Transl. by B.G.

N84-33845# Hokkaido Univ., Sapporo (Japan).
RADIATION MEASUREMENT OF SNOWY SEASON IN 1982-1983 AT SAPPORO **c43**
Nobuyoshi Ishikawa, Kenji Kojima, Hideaki Motoyama, and Yoshinori Yamada *In its* Data Rept. Low Temp. Sci. Ser. A: Phys. Sci. 1983 p 25-31 refs In JAPANESE (For primary document see N84-33842 23-42)
Avail: NTIS HC A05/MF A01

The results of radiation measurement of the 1982-83 snowy season in Sapporo are reported. Optical and radiational characteristics of snow cover have been studied every winter at the observation site of the Institute of Low Temperature Science, Hokkaido University. Solar radiation, reflection, albedo of snow surface, net radiation, snow depth, wind speed, and the weather are recorded and presented in graph form. In order to facilitate comparison of present and past data, IPS-1956 is used in this report instead of WRR. Net radiation value stays negative between December and February and changes to positive as solar radiation increases and albedo decreases. Transl. by B.G.

N84-33846# Hokkaido Univ., Sapporo (Japan).
DISTRIBUTION OF PACK ICE OF OKHOTSK SEA COAST OF HOKKAIDO OBSERVED WITH SEA ICE RADAR NETWORK, JANUARY-APRIL 1983 **c48**
Masaaki Aota, Toshiyuki Kawamura, Masayuki Oi, Masao Ishikawa, and Hiroki Fukushi *In its* Data Rept. Low Temp. Sci. Ser. A: Phys. Sci. 1983 p 33-55 In JAPANESE (For primary document see N84-33842 23-42)
Avail: NTIS HC A05/MF A01

The distribution of pack ice off Okhotsk sea coast of Hokkaido was studied at 9:00 every morning between January 20 and April 14, 1983. The results of the study are shown in the form of charts, with slanting lines representing floating ice. The charts are based on sea ice radar observation data, which is first manually plotted and is then corrected and/or supplemented with the aid of PPI film. The ice field contained frozen lakes of all sizes, among which giant frozen lakes and ice order served as focal points. PPI pictures were taken every 3 hours each day between January 16 and April 14. Transl. by B.G.

N84-33847# Hokkaido Univ., Sapporo (Japan).
BASIC PROGRAMS 2 **c61**
Tamotsu Ishida *In its* Rept. Low Temp. Sci. Ser. A: Phys. Sci. 1983 p 57-71 In JAPANESE (For primary document see N84-33842 23-42)
Avail: NTIS HC A05/MF A01

The analog recording of data collected at the time of outdoor observations was usually processed and analyzed by microcomputer after A-D conversion. The A-D conversion board contained in most microcomputers, however, usually has poor capability. An attempt was made to use MIDAS-16 for A-D conversion and to feed digital output of the small module data acquisition system into IF-800/20 microcomputer via a built-in digital I/O board. Program 1 and 1.1 concerns A-D conversion; program 2.1 and 2.2, data exchange between microcomputers; program 3.1 and 3.2, file dump and how to protect the content of Directory and FAT from blanking; program 4, effective use of file, filing of data and correcting of data file; Program 5, sorting, especially of character array and subprogram for input of non-ASCII data file.
Transl. by B.G.

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography.*

N84-33848# Committee on Science and Technology (U. S. House).
THE LAND REMOTE-SENSING COMMERCIALIZATION ACT OF 1984
Washington GPO 1984 168 p Hearing on H. R. 4836 and H. R. 5155 before the Subcomm. on Nat. Resources, Agr. Res. and Environ. and the Subcomm. on Space Sci. and Appl. of the the Comm. on Sci. and Technol., 98th Congr., 2nd Sess., No. 74, 6 Mar. 1984
(GPO-33-947) Avail: Subcommittee on Natural Resources, Agriculture Research and Environment

A process is currently in progress which is intended to effect the transfer of the LANDSAT system from the federal government to the private sector. The proceedings of the hearing before two subcommittees of the Committee on Science and Technology of

the U.S. House of Representatives is provided. The tangible and intangible public benefits that flow from operational remote sensing managed in the public interest are outlined. The possible social, economic, and political losses of the federal government abandoning civilian land remote sensing altogether are summarized. R.S.F.

N84-33849# Committee on Government Operations (U. S. House).
INTERNATIONAL IMPLICATIONS OF PROPOSED SALE OF LANDSAT SATELLITE
Washington GPO 1984 149 p Hearing before a Subcomm. of the Comm. on Govt. Operations, 98th Congr., 1st Sess., 28 Sep. 1983
(GPO-31-310) Avail: Committee on Government Operations

The proposed commercialization of the LANDSAT satellite system is examined with emphasis on international implications. The impact of this technology transfer on developing nations, United States foreign policy, marketing, and investments (foreign and domestic), is considered. The effects on domestic economic development are explored. S.B.

N84-33850# Committee on Government Operations (U. S. House).
SALE OF LANDSAT COULD ADVERSELY AFFECT INTERNATIONAL RELATIONS
Washington GPO 1984 16 p refs Rept. presented by the Comm. on Govt. Operations, 98th Congr., 2nd Sess., 28 Sep. 1984
(H-Rept-98-1108; GPO-38-469; Rept-48) Avail: US Capitol, House Document Room

How LANDSAT data are being used by various nations around the world is reviewed and the possible impact that the sale of the LANDSAT system would have on U.S. relations with other countries is examined. Developments which could affect the future operation of either a government or privately owned LANDSAT system are also considered. S.B.

N84-33851# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
ON THE USE OF METEOROLOGIC SATELLITES IN HYDROLOGY [O USO DE SATELITES METEOROLOGICOS EM HIDROLOGIA]
L. C. B. Molion Sep. 1983 15 p refs In PORTUGUESE Presented at the 5th Simposio Brasileiro de Hidrologia e Recursos Hidricos, Blumenau, 13-18 Nov. 1983
(INPE-2879-PRE/404) Avail: NTIS HC A02/MF A01

Meteorologic satellites serve several functions in the field of hydrology. Forecasts of river flow reaching reservoirs and quantitative precipitation forecasts depend heavily on weather analysis and prediction. Both activities are improved significantly when satellite data are added to conventional climatologic data. Rainfall can be estimated from satellite imagery, and satellites can be used to relay data collected through automatic stations. The great advantages of this type of data collection system are the timely acquisition of hydrologic data and the low cost involved in the long range operation, since the transmission of these data does not depend on the particular distance to be covered between the transmitting and receiving stations. The two types of operational meteorologic satellites, geostationary and polar orbit, are described, and use of their imagery in hydrology is discussed. B.G.

N84-33852# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
QUALITY MEASURES FOR ESTIMATING THE PROPORTIONS OF DIFFERENT CLASSES WITHIN A SINGLE IMAGE RESOLUTION ELEMENT (PIXEL) [MEDIDAD DE QUALIDADE DE ESTIMADORES DE PROPORCOES DE CLASSES DENTRO DE UM PIXEL DE IMAGENS DE SATELITE]
Nelson Delfino DAvila Mascarenhas and Virginia Ragoni M. Correia Jun. 1983 46 p refs In PORTUGUESE Presented at the 34th Reuniao Anual da Sociedade Brasileira para Progresso da Ciencia - Campinas, Julho, 1982
(INPE-2791-PRE/354) Avail: NTIS HC A03/MF A01

Methods based on statistical regression models are proposed for estimating the proportion of different classes within a single image resolution element, or pixel. The variance of the estimators depends on the geometry defined by the statistical average vectors of different land use classes. New measures related to the quality of that geometry are proposed that are based on the notions of angles defined by the geometry and on the condition number of the problem. Results concerning previously proposed quality measures, geometric angle, and variations of estimates with the condition number are presented. B.G.

N84-33853# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
MAPPING PROJECT ON LAND USE CHANGES IN THE CARBONIFEROUS REGION OF SANTA CATARINA Preliminary Report [PROJETO MAPEAMENTO DA ALTERACAO DO USO DO SOLO DA REGIAO CARBONIFERA DE SANTA CATARINE - RELATORIO PRELIMINAR]
Dalton deMorisson Valeriano and Marisa Dantas B. Pereira Sep. 1983 14 p refs Sponsored in part by CNPq-INPE/FUNCATE and Secretaria do Meio Ambiente (SEMA)
(NASA-CR-173946; NAS 1.26:173946; INPE-2874-NTE/204) Avail: NTIS HC A02/MF A01 CSCL 05B

The utilization of remote sensing data for monitoring land use changes by means of digital image analysis is described. The following data were utilized: LANDSAT data from September 4, 1975, April 24, 1978, and September 8, 1981; LANDSAT paper photography data; area IV color photographs; IBGE topography maps, and auxiliary data about the Brazilian state of Santa Catarina. Three kinds of analyses of digital images were carried out. The project identified and mapped major classes of land use areas including urban areas, coal deposits, agricultural areas, forests, lakes, and flood plains. Five areas directly affected by coal exploration southeast of Santa Catarina are identified and described. In addition, the classification system used for organizing data about land cover in a hierarchical arrangement is presented. The project made use of two remote sensing data sources: data of MSS spectral (Mulitspectral Scanner System)/LANDSAT on a scale of 1:100,000 with approximately 80 m resolution, and infrared color aerial photographs on a scale of 1:45,000 with approximately 5 m resolution. Therefore, the classification system included three levels, two selected to be compatible with aerial photography data and the third to conform to the resolution of MSS/LANDSAT.
Transl. by B.G.

N84-33854# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
IRRIGATED LANDS: MONITORING BY REMOTE SENSING [AREAS IRRIGADAS: MONITORAMENTO POR SENSORIAMENTO REMOTO]
Jose Carlos Neves Epiphanio and Icaro Vitorelli Aug. 1983 21 p refs In PORTUGUESE Submitted for publication
(NASA-CR-173945; NAS 1.26:173945; INPE-2852-PRE/392) Avail: NTIS HC A02/MF A01 CSCL 08B

The use of remote sensing for irrigated areas, especially in the region of Guaira, Brazil (state of Sao Paulo), is examined. Major principles of utilizing LANDSAT data for the detection and mapping of irrigated lands are discussed. In addition, initial results obtained by computer processing of digital data, use of MSS (Multispectral Scanner System)/LANDSAT products, and the availability of new remote sensing products are highlighted. Future activities include the launching of the TM (Thematic Mapper)/LANDSAT 4 with 30 meters of resolution and SPOT (Systeme Probatorie d'Observation de la Terre) with 10 to 20 meters of resolution, to be operational in 1984 and 1986 respectively.
Transl. by B.G.

N84-33855# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
FORESTRY INVENTORY BASED ON MULTISTAGE SAMPLING WITH PROBABILITY PROPORTIONAL TO SIZE [INVENTARIO DE FLORESTA PLANTADA ATRAVES DE AMOSTRAGEM EM MULTIPLO ESTAGIO COM PROBABILIDADE PROPORCIONAL A GRANDEZA]

David Chung Liang Lee, Pedro Hernandez, Jr., and Yosio Edemir Shimabukuro Sep. 1983 36 p refs In PORTUGUESE (INPE-2869-RPE/441) Avail: NTIS HC A03/MF A01

A multistage sampling technique, with probability proportional to size, is developed for a forest volume inventory using remote sensing data. The LANDSAT data, Panchromatic aerial photographs, and field data are collected. Based on age and homogeneity, pine and eucalyptus classes are identified. Selection of tertiary sampling units is made through aerial photographs to minimize field work. The sampling errors for eucalyptus and pine ranged from 8.34 to 21.89 percent and from 7.18 to 8.60 percent, respectively. M.A.C.

N84-33856# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

A COMPARATIVE STUDY OF DIFFERENT PRODUCTS OF SENSOR SYSTEMS APPLIED IN A LITHOLOGIC-STRUCTURAL ANALYSIS OF THE QUADRILATERO FERRIFERO AREA, MINAS GERAIS M.S. Thesis - 18 Jul. 1983 [ESTUDO COMPARATIVO ENTRE DIFERENTES PRODUTOS DE SISTEMAS SENSORES APLICADOS A ANALISE LITOLOGICO-ESTRUTURAL NO QUADRILATERO FERRIFERO, MINAS GERAIS]

Claudio Riccomini Jul. 1984 115 p refs In PORTUGUESE; ENGLISH summary Original doc. contains color illustrations (INPE-3210-TDL/174) Avail: NTIS HC A06/MF A01

Through the integrated analysis of remote sensing products, such as RBV-LANDSAT and MSS-LANDSAT imagery (channels 5, 6 and 7, in paper prints and computer compatible tapes - CCTs in the MSS case), semicontrolled mosaics of radar airborne imagery (NASA Mission 96 and RADAMBRASIL Project) and aerial Ektach- (NASA Mission 96 and RADAMBRASIL Project) and aerial Ektachrome MS Aerographic and Ektachrome IR Aerographic photo of the performance of these products in the lithologic-structural analysis of the Quadrilatero Ferrifero area (Minas Gerais State, Brazil). The adopted methology consisted basically on visual interpretation, first of the small scale products (LANDSAT and radar imagery), and afterwards of the middle scale products (LANDSAT MSS enlarged and processed in the Image-100 computer), and finally the large scale products (aerial photographs). The results obtained from photointerpretation were then compared to available geological maps and bibliography which was followed by a field investigation. RBV and MSS-LANDSAT imagery has demonstrated a good performance in geological mapping, with an information degree compatible to their scales of presentation. Author

N84-33857# European Space Agency, Paris (France).

INTERNATIONAL GEOSCIENCE AND REMOTE SENSING SYMPOSIUM (IGARSS) 84. REMOTE SENSING: FROM RESEARCH TOWARDS OPERATIONAL USE, VOLUME 1

T. D. Guyenne, ed. and J. J. Hunt, ed. Aug. 1984 574 p refs Partly in ENGLISH and FRENCH Proc. held at Strasbourg, 27-30 Aug. 1984; sponsored by IEEE Geoscience and Remote Sensing Society, Council of Europe, CNES, DFVLR, EARSeL, ESA and NASA Original contains color illustrations 2 Vol. (ESA-SP-215-Vol-1; ISSN-0379-6566) Avail: NTIS HC A24/MF A01; ESA, Paris $44

Spacelab Metric Camera experiments; the Modular Optoelectronic Multispectral Scanner; LANDSAT Thematic Mapper; vegetation monitoring; microwave monitoring in geology, pedology and hydrology; multitemporal monitoring; remote sensing of land use; multisensor monitoring; sea surface, waves and winds remote sensing; ice mapping; atmospheric sounding; optical, infrared and radar sensors; electromagnetic probing; and air and water pollution monitoring were discussed. For individual titles, see N84-33858 through N84-33945.

N84-33858# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Wesseling (West Germany). Inst. fuer Optoelectronik.

FLIGHT PERFORMANCE OF THE SPACELAB METRIC CAMERA EXPERIMENT

M. Schroeder *In* ESA IGARSS 84. Remote Sensing: From Res. Towards Operational Use, Vol. 1 Aug. 1984 p 3-14 refs Original contains color illustrations (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

The Spacelab metric camera experiment acquired stereoscopic high resolution black and white and color infrared photographs of various regions of the world to test the mapping capability of high resolution space photography for compiling topographic and thematic maps espcially in unpopulated or less developed regions of the world, and updating and revising topographic and thematic maps in populated and developed areas of the world. An area of 11 million sq km was covered. Due to the delayed November 28 launch date, illumination conditions were frequently poor over many candidate targets. However, high quality images with a ground resolution of 20 m were obtained by increasing camera exposure time. Author (ESA)

N84-33859# Politecnico di Milano (Italy). Ist. di Topografia, Fotogrammetria e Geofisica.

ANALYSIS OF THE METRIC CAMERA BLACK AND WHITE IMAGES OVER ITALY

G. Togliatti and A. Moriondo *In* ESA IGARSS 84. Remote Sensing: From Res. Towards Operational Use, Vol. 1 Aug. 1984 p 15-18 (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

Spacelab metric camera based altimetric and planimetric measurements are discussed. Photographic quality is poorer than expected due to a spool accident, lighting conditions and to the absence of an image motion compensator. The latter is essential for all future missions, to make the use of slower films possible. Given the very good metric performances of the satellite images, the adoption of color film is suggested, since the small loss of accuracy could be afforded in order to enhance color contrast between different objects. Author (ESA)

N84-33860# European Space Research and Technology Center, Noordwijk (Netherlands).

SOME CONSIDERATIONS OF THE OPERATIONS OF OPTICAL IMAGING SPACE SENSORS DERIVED FROM THE EXPERIENCE OF THE METRIC CAMERA PROJECT

M. L. Reynolds and D. Soederman (European Centre for Medium-Range Weather Forecasts) *In* ESA IGARSS 84. Remote Sensing: From Res. Towards Operational Use, Vol. 1 Aug. 1984 p 19-22 refs (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

Communication problems caused by operating the Spacelab metric camera by a technical team attempting to provide an image data product to a large number of data users, and managing ressources so as to optimize the return of usable data are discussed. As the number of experimenters participating in the exploitation of Earth Observation facilities increases, the difficulty of communications becomes more apparent. The electronic mail box is a viable alternative to conventional systems. Spacelab proves the possibility to plan resource utilization on the basis of cloud cover production. It should thus be possible to appreciably reduce the quantity of useless image data being collected, recorded, transmitted and processed. Author (ESA)

N84-33861# Technische Univ., Munich (West Germany).

MODULAR OPTOELECTRONIC MULTISPECTRAL SCANNER (MOMS) PROGRAM OUTLINE AND FUTURE ASPECTS

J. Bodechtel *In* ESA IGARSS 84. Remote Sensing: From Res. Toward Operational Use, Vol. 1 Aug. 1984 p 25-27 (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

The Modular Optoelectronic Multispectral Scanner (MOMS) was designed for regional and global optical remote sensing applications. It was mounted on the Shuttle Pallet Satellite aboard STS-7 and STS-11. The missions served the technological space verification of the sensor and the demonstration of geoscientific and application-oriented experiments in worldwide distributed areas. Development aims include the realization of a complex remote sensing device. Author (ESA)

N84-33862# Technische Univ., Munich (West Germany).
MODULAR OPTOELECTRONIC MULTISPECTRAL SCANNER (MOMS)-01 ON STS-7 AND STS-11: MISSIONS AND RESULTS
J. Bodechtel, D. Meissner (MBB GmbH, Ottobrunn, West Germany), P. Seige (DFVLR), R. Haydn (DFVLR), and H. Winkenbach *In* ESA IGARSS 84. Remote Sensing: From Res. Towards Operational Use, Vol. 1 Aug. 1984 p 29-32 refs (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

The Modular Optoelectronic Multispectral Scanner (MOMS) missions on STS-7 and 11 are summarized. The MOMS scientific and technical objectives included mapping of different ground targets with low to high contrast and albedo in visible and near infrared part of the spectrum over arid areas, areas with dense and sparse natural vegetation, coastal zones, mountainous regions and open ocean; and system verification under space conditions for the two channel version to demonstrate the capability for scan line extension and the ability to combine pixel-coincident modules. Results indicate that radiometric and geometric properties of MOMS data are satisfactory. Author (ESA)

N84-33863# Technische Univ., Munich (West Germany).
THE INFORMATION NETWORK FOR A REAL-TIME CONTROLLED DATA ACQUISITION OF THE MODULAR OPTOELECTRONIC MULTISPECTRAL SCANNER (MOMS)
J. Bodechtel, K. Hiller (DFVLR, Oberpfaffenhofen, West Germany), G. Landauer (DFVLR, Oberpfaffenhofen, West Germany), P. Seige (DFVLR, Oberpfaffenhofen, West Germany), A. Yamani, and J. Zilger *In* ESA IGARSS 84. Remote Sensing: From Res. Towards Operational Use, Vol. 1 Aug. 1984 p 33-36 refs (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

To maximize the scientific profit of the Modular Optoelectronic Multispectral Scanner missions during STS-7 and STS-11 flights, an information network for real-time controlled data acquisition was set up. Geoscientific preinformation and weather data of geostationary weather satellites were used to define the areas for imaging sequences. For Earth oriented dedicated missions, the model optimizes data acquisition by avoiding imaging over cloud-covered or geoscientifically irrelevant areas. Author (ESA)

N84-33864# Technische Univ., Munich (West Germany). Inst. fuer Allgemeine und Angewandte Geologie.
SPECTRAL SIGNIFICANCE OF MODULAR OPTOELECTRONIC MULTISPECTRAL SCANNER (MOMS) VERSUS LANDSAT DATA AND FUTURE ASPECTS: PRELIMINARY RESULTS
H. Kaufmann, J. Bodechtel, and R. Haydn *In* ESA IGARSS 84. Remote Sensing: From Res. Towards Operational Use, Vol. 1 Aug. 1984 p 39-44 refs (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

During the Modular Optoelectronic Multispectral Scanner (MOMS) missions on STS-7 and 11, data of different climate zones were acquired over worldwide distributed target areas. Geometric and radiometric properties and the significance of spectral bands are discussed. The extension of MOMS by a SWIR-band to a three channel system, and stereoscopic data acquisition are considered. The MOMS system prove to be a highly resolving instrument with exact geometric image accuracy. Apart from focusing problems of the infrared channel and striping effects caused by calibration differences the recorded data allow interpreters to produce maps to scales of 1:50,000. The two spectral bands of MOMS are well defined in the visible and near infrared and in relation to the detected surfaces are correlated. Compared to corresponding LANDSAT data they are especially sensitive to vegetated areas and are useful to identify and map limonitic and alteration zones. Author (ESA)

N84-33865# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Wesseling (West Germany).
MODULAR OPTOELECTRONIC MULTISPECTRAL SCANNER (MOMS) DATA OF BOLIVIA: COMPARISON WITH LANDSAT MULTISPECTRAL SCANNER (MSS) AND GEOLOGICAL INTERPRETATION
K. Hiller and M. Hauck (Technische Univ., Munich) *In* ESA IGARSS 84. Remote Sensing: From Res. Towards Operational Use, Vol. 1 Aug. 1984 p 45-48 refs (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

Data from Modular Optoelectronic Multispectral Scanner (MOMS-01) over the Andes in southern Bolivia, northern Chile and Argentinia are used to identify geological features on the surfaces of Salar de Uyuni, Salar Punta Negra and Salar de Arizaro. Giant polygons, shorelines, salt channels and wind plumes are distinguishable. The comparison with corresponding LANDSAT-MSS data in the 600 nm range reveals the advantages of the MOMS 20 m versus LANDSAT versus 80 m resolution with respect to the morphology of salt crusts. Author (ESA)

N84-33866# Technische Univ., Munich (West Germany). Inst. fuer Geographie.
MODULAR OPTOELECTRONIC MULTISPECTRAL SCANNER (MOMS), INTERPRETATION AND EVALUATION OF THE MOMS-IMAGE ARICA, WEST COAST OF SOUTH AMERICA
H. G. Gierloff-Emden *In* ESA IGARSS 84. Remote Sensing: From Res. Towards Operational Use, Vol. 1 Aug. 1984 p 49-57 refs (For primary document see N84-33857 23-43)
(Contract BMFT-FKZ-01-QS-103-3)
Avail: NTIS HC A24/MF A01

Modular Optoelectronic Multispectral Scanner (MOMS) images from nothern Chile obtained during STS-7 are discussed. Thematic mapping, photogeology, and oceanographic uses are considered. Analysis shows that the MOMS-imaging experiment from orbit is successful. The MOMS System can deliver images with additional information for thematic maps (from 300 km orbit height) up to map scales 1:100,000, if the data are processed with different advanced correctial-algorithms. An evaluation for topographic maps under these conditions is possible for map scales up to 1:200 000. The geometric conditions are very good. An additional spectral band is advocated. Author (ESA)

N84-33867# Technische Univ., Munich (West Germany). Inst. for General and Applied Geology.
THE PILBARA DISTRICT IN NORTHWESTERN AUSTRALIA: A CASE STUDY FOR THE GEOLOGICAL APPLICATION OF MODULAR OPTOELECTRONIC MULTISPECTRAL SCANNER (MOMS) AND LANDSAT DATA
F. Jaskolla *In* ESA IGARSS 84. Remote Sensing: From Res. Towards Operational Use, Vol. 1 Aug. 1984 p 59-62 refs (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

By use of Modular Optoelectronic Multispectral Scanner and LANDSAT-MSS data, a geological mapping in Northwestern Australia / Pilbara district was carried out. Based on combined imageries of both systems via the IHS-approach, important improvements for geology can be elaborated. Author (ESA)

N84-33868# Marconi Co. Ltd., Chelmsford (England).
SIMPLE MTI USING SYNTHETIC APERTURE RADAR
A. Freeman *In* ESA IGARSS 84. Remote Sensing: From Res. Towards Operational Use, Vol. 1 Aug. 1984 p 65-70 refs Sponsored by UK Ministry of Defence Procurement Executive (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

A moving target imaging (MTI) approach using a four-element prefilter prior to azimuth compression in SAR processing is described. A discrete-time analysis leading to accurate plots of impulse response functions for moving point targets using this approach is used to examine the behavior of the imaged moving targets. Results on image degradation in MTI are presented. A SAR image and an MTI image of the same area, containing several moving targets, are shown, demonstrating the potential of SAR systems for imaging moving objects at ground or sea level. Author (ESA)

N84-33869# Environmental Research Inst. of Michigan, Ann Arbor. Radar Div.
A SAR FOR REAL-TIME ICE RECONAISSANCE
A. Nichols, T. Gaffield, J. Wilhelm, R. Inkster (Intera Environmental Consultants Ltd., Calgary, Alberta), and S. Leung (Intera Environmental Consultants Ltd., Calgary, Alberta) *In* ESA IGARSS 84. Remote Sensing: From Res. Towards Operational Use, Vol. 1 Aug. 1984 p 71-76 (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

A small lightweight SAR for ice monitoring was built to support engineering operations for oil exploration in the Arctic. The SAR is a fully-focused sidelooking system capable of mapping either side of the aircraft. It has two modes, Wide Swath, which covers 45 km, and High Resolution, which covers 22 km. Azimuth resolution is 6 m for both modes, with range resolution 12 m in the Wide Swath and 6 m in the High Resolution mode. The instrument is installed in a Cessna 441 Conquest capable of flying at high altitudes with minimum fuel consumption. An image is produced in real time by a digital image formation processing system aboard the aircraft. This image is transmitted to a ground station via a data link where a hardcopy is formed on heat-developed film. Author (ESA)

N84-33870# Osaka Electro-Communication Univ. (Japan).
RETRIEVAL FOR REMOTE SENSING IMAGE DATA BASE WITH MULTIMEDIA USER INTERFACE
Motoyasu Nagata *In* ESA IGARSS 84. Remote Sensing: From Res. Towards Operational Use, Vol. 1 Aug. 1984 p 77-82 refs Sponsored by Japan Foundation for Ship Building Advancement and Remote Sensing Technology Center of Japan Original contains color illustrations (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

Methods and experimental implementation concerning retrieval for remote sensing image databases with multimedia user interface whose inputs are string patterns of map and geographic attributes are described. Image retrieval method by the string pattern input and the string matching of the geographic information are emphasized. A geometric structure which represents the string pattern in the remote sensing image, and is composed of four relational files is proposed. The arc decomposition algorithm which provides the relational file structure of the string pattern is proposed. The string matching algorithm based on input pattern splitting and the relational file structure is described. Author (ESA)

N84-33871*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
LANDSAT-4 MSS AND THEMATIC MAPPER DATA QUALITY AND INFORMATION CONTENT ANALYSIS
P. Anuta, L. Bartolucci, E. Dean, F. Lozano, E. Malaret, C. McGillem, J. Valdes, and C. Valenzuela *In* ESA IGARSS 84. Remote Sensing: From Res. Towards Operational Use, Vol. 1 Aug. 1984 p 85-92 refs (For primary document see N84-33857 23-43)
(Contract NAS5-26859)
Avail: NTIS HC A24/MF A01 CSCL 05B

LANDSAT-4 thematic mapper (TM) and multispectral scanner (MSS) data were analyzed to obtain information on data quality and information content. Geometric evaluations were performed to test band-to-band registration accuracy. Thematic mapper overall system resolution was evaluated using scene objects which demonstrated sharp high contrast edge responses. Radiometric evaluation included detector relative calibration, effects of resampling, and coherent noise effects. Information content evaluation was carried out using clustering, principal components, transformed divergence separability measure, and supervised classifiers on test data. A detailed spectral class analysis (multispectral classification) was carried out to compare the information content of the MSS and TM for a large number of scene classes. A temperature-mapping experiment was carried out for a cooling pond to test the quality of thermal-band calibration. Overall TM data quality is very good. The MSS data are noisier than previous LANDSAT results. Author (ESA)

N84-33872*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE EFFECT OF SPATIAL, SPECTRAL AND RADIOMETRIC FACTORS ON CLASSIFICATION ACCURACY USING THEMATIC MAPPER DATA
R. Wrigley, W. Acevedo (Technicolor Government Services, Inc.), D. Alexander (Technicolor Government Services, Inc.), J. Buis (Technicolor Government Services, Inc.), and D. Card *In* ESA IGARSS 84. Remote Sensing: From Res. Towards Operational Use, Vol. 1 Aug. 1984 p 93-100 refs (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01 CSCL 05B

An experiment of a factorial design was conducted to test the effects on classification accuracy of land cover types due to the improved spatial, spectral and radiometric characteristics of the LANDSAT Thematic Mapper (TM) in comparison to the Multispectral Scanner (MSS). High altitude aircraft scanner data from the Airborne Thematic Mapper instrument was used to simulate TM data as well as all combinations of the three characteristics for eight data sets in all. Results for the training sites (field-center pixels) show better classification accuracies for MSS spatial resolution, TM spectral bands and TM radiometry in order of importance. Author (ESA)

N84-33873# Eidgenoessische Technische Hochschule, Zurich (Switzerland). Inst. fuer Kommunikationstechnik.
STRUCTURAL DESCRIPTION OF A LANDSAT THEMATIC MAPPER (TM) SCENE FOR IMPROVED REGION-BASED CLASSIFICATION
G. Gerig and K. Seidel *In* ESA IGARSS 84. Remote Sensing: From Res. Towards Operational Use, Vol. 1 Aug. 1984 p 101-105 refs (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

A region-based approach was tested on a LANDSAT Thematic Mapper subimage frame to investigate its ability to eliminate major drawbacks of standard multispectral classification. To overcome difficulties arising from low signal to noise ratio and the poor dynamic range of videovalues within each spectral band, a multispectral edge-preserving smoothing algorithm was developed. A gradient-based segmentation partitions the smoothed image into homogeneous regions by grouping neighboring pixels with similar spectral properties, the basic intrinsic characteristics of which are collected in a property table. This structural description of the image serves as a starting point for knowledge-based interpretation in terms of land use categories. Author (ESA)

N84-33874# Minnesota Univ., St. Paul. Dept. of Soil Science.
CHANGES IN TM RESPONSE OF SOIL SCENES DUE TO TILLAGE, RESIDUE, AND WEATHERING
M. Seeley, E. Larson, C. Schrader, and D. Linden (Agricultural Research Service, St. Paul, Minn.) *In* ESA IGARSS 84. Remote Sensing: From Res. Towards Operational Use, Vol. 1 Aug. 1984 p 107-110 refs Sponsored by USDA (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

In order to determine how LANDSAT Thematic Mapper (TM) spectral response for a single soil type varies with alternative tillage and crop residue management strategies, changes in spectral response of a Waukegan silt loam soil were induced by variable tillage and crop residue management on replicated plots. Variable random roughness has little effect. Differential weathering of these soil surfaces is spectrally evident over time. Crop residue type and amount have significant effects on spectral response when the surface coverage exceeds 35%. Author (ESA)

N84-33875*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex. Earth Science and Applications Div.
SPECTRAL CHARACTERIZATION OF BIOPHYSICAL CHARACTERISTICS IN A BOREAL FOREST: RELATIONSHIP BETWEEN THEMATIC MAPPER BAND REFLECTANCE AND LEAF AREA INDEX FOR ASPEN
G. D. Badhwar, R. B. MacDonald, F. G. Hall, and J. G. Carnes *In*

ESA IGARSS 84. Remote Sensing: From Res. Towards Operational Use, Vol. 1 Aug. 1984 p 111-115 refs (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01 CSCL 05B

Results from analysis of a data set of simultaneous measurements of Thematic Mapper band reflectance and leaf area index are presented. The measurements were made over pure stands of Aspen in the Superior National Forest of northern Minnesota. The analysis indicates that the reflectance may be sensitive to the leaf area index of the Aspen early in the season. The sensitivity disappears as the season progresses. Based on the results of model calculations, an explanation for the observed relationship is developed. The model calculations indicate that the sensitivity of the reflectance to the Aspen overstory depends on the amount of understory present. Author (ESA)

N84-33876# Kansas Univ. Center for Research, Inc., Lawrence. Lab. of Remote Sensing.
MODELING THE POLARIZATION DEPENDENCE OF THE ATTENUATION IN VEGETATION CANOPIES
C. T. Allen and F. T. Ulaby *In* ESA IGARSS 84. Remote Sensing: From Res. Towards Operational Use, Vol. 1 Aug. 1984 p 119-124 refs (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

A model for computing the loss-factor of a vegetation canopy was developed. It assumes that the leaves may be treated as randomly distributed disks, and that the stalks are vertical cylinders. The vertical structure of the stalks leads to a strong polarization dependence, as predicted by the model and supported by experimental observations. Loss measurements made at 10.2 GHz for wheat and soybean canopies are compared to model calculations. The geometry of the stalks in a wheat canopy results in a polarization-dependent absorption coefficient that varies by two or more orders of magnitude, depending upon the choice of polarization, frequency, and incidence angle, as well as upon the prevailing canopy conditions. A similar, though less dynamic, behavior is seen in the wheat-head absorption coefficient. Due to the random nature of leaf distribution in the soybean canopy, no polarization dependence is seen. Author (ESA)

N84-33877*# Kansas Univ. Center for Research, Inc., Lawrence. Lab. of Remote Sensing.
THE EFFECT OF ROW DIRECTION ON THE MICROWAVE EMISSION FROM VEGETATION CANOPIES
D. R. Brunfeldt and F. T. Ulaby *In* ESA IGARSS 84. Remote Sensing: From Res. Towards Operational Use, Vol. 1 Aug. 1984 p 125-130 refs (For primary document see N84-33857 23-43) (Grant NAG5-30)
Avail: NTIS HC A24/MF A01 CSCL 05B

Experiments were conducted to determine the microwave brighthness temperature of corn and soybean canopies as a function of polarization and azimuth look direction. A strong dependence on row direction and polarization is observed for soybeans. The corn canopy shows a similar dependence, although to a lesser extent. The variation in brightness temperature is shown to be related to the canopy alone, since the underlying soil surface was blocked by reflecting metal screens. Author (ESA)

N84-33878*# National Aeronautics and Space Administration. Earth Resources Labs., Bay St. Louis, Miss.
PARAMETRIC ANALYSIS OF SYNTHETIC APERTURE RADAR DATA ACQUIRED OVER TRUCK GARDEN VEGETATION
S. T. Wu *In* ESA IGARSS 84. Remote Sensing: From Res. Towards Operational Use, Vol. 1 Aug. 1984 p 131-135 refs Sponsored by Bundesministerium fuer Forschung und Technologie and DVFLR Original contains color illustrations (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01 CSCL 05B

An airborne X-band SAR acquired multipolarization and multiflight pass SAR images over a truck garden vegetation area. Based on a variety of land cover and row crop direction variations, the vertical (VV) polarization data contain the highest contrast, while cross polarization contains the least. When the radar flight path is parallel to the row direction, both horizontal (HH) and VV polarization data contain very high return which masks out the specific land cover that forms the row structure. Cross polarization data are not that sensitive to row orientation. The inclusion of like and cross polarization data help delineate special surface features (e.g., row crop against non-row-oriented land cover, very-rough-surface against highly row-oriented surface). Author (ESA)

N84-33879# Technische Univ., Freising (West Germany). Lehrstuhl fuer Pflanzenbau und -zuechtung.
THE X, AND L-BAND RADAR BACKSCATTERER ANALYSIS OF AGRICULTURAL CROPS IN WEST GERMANY
H. Ernst and G. Fischbeck *In* ESA IGARSS 84. Remote Sensing: From Res. Towards Operational Use, Vol. 1 Aug. 1984 p 137-140 refs (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

Dual like-polarized X and L-band agricultural test site data were digitally recorded, processed and analyzed by using an interactive image analysis system. Mean gray levels from sugar beet, potatoes, wheat and barley fields were computed and compared to a comprehensive set of ground truth information. The data indicate surface scattering from cereal fields, but even L-band waves are influenced by the phytomass density in the ear region of wheat cultivars and barley. Absorption of longer waves by the canopy increases with canopy moisture content, especially at vertical polarization. Root crops show the highest radar return in both frequencies. Percent soil cover and row direction of potato fields influence radar backscatter only at longer wavelengths. Otherwise soil surface does not affect radar return. Author (ESA)

N84-33880# Wageningen Agricultural Univ. (Netherlands). Dept. of Landsurveying and Remote Sensing.
RADAR BACKSCATTERING OF FOREST STANDS
Dirk H. Hoekmann *In* ESA IGARSS 84. Remote Sensing: From Res. Towards Operational Use, Vol. 1 Aug. 1984 p 141-148 refs (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

Results of four X-band SLAR-flights are analysed. The digital radar images obtained are accurately corrected both geometrically and radiometrically and indicate gamma values instead of arbitrary arbitrary graytones. Radar signatures of 16 classes of forest stands were derived from these images showing seasonal and angular effects. Phenomena observed indicate effects of vegetation structure on radar backscattering. Results demonstrate the appropriateness of X-band in the classification of (Dutch) forests. A classification simulation yields overall error fractions ranging from 10% to 16% at a polder test area and 14% to 28% at another test area. This can be demonstrated in multitemporal radar images as well as in actual classified images. Author (ESA)

N84-33881*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
USE OF MULTI-FREQUENCY, MULTI-POLARIZATION, MULTI-ANGLE AIRBORNE RADARS FOR CLASS DISCRIMINATION IN A SOUTHERN TEMPERATURE FOREST
Naresh C. Mehta *In* ESA IGARSS 84. Remote Sensing: From Res. towards Operational Use, Vol. 1 Aug. 1984 p 149-154 refs (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01 CSCL 05B

The utility of radar scatterometers for discrimination and characterization of natural vegetation was investigated. Backscatter measurements were acquired with airborne multi-frequency, multi-polarization, multi-angle radar scatterometers over a test site in a southern temperate forest. Separability between ground cover classes was studied using a two-class separability measure. Very good separability is achieved between most classes. Longer wavelength is useful in separating trees from non-tree classes, while shorter wavelength and cross polarization are helpful for discrimination among tree classes. Using the maximum likelihood classifier, 50% overall classification accuracy is achieved using a single, short-wavelength scatterometer channel. Addition of multiple incidence angles and another radar band improves classification accuracy by 20% and 50%, respectively, over the single channel

accuracy. Incorporation of a third radar band seems redundant for vegetation classification. Vertical transmit polarization is critically important for all classes. Author (ESA)

N84-33882# Centre dÉtude Spatiale des Rayonnements, Toulouse (France).
ON THE RELATIONSHIPS BETWEEN RADAR BACKCATTERING COEFFICIENT AND VEGETATION CANOPY CHARACTERISTICS
T. LeToan, A. Lopes, and M. Huet *In* ESA IGARSS 84. Remote Sensing: From Res. Towards Operational Use, Vol. 1 Aug. 1984 p 155-160 refs Prepared in cooperation with CNRS, Toulouse, and Toulouse Univ. (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

Laboratory and in situ investigations relating the radar backscattering coefficient to characteristics of a wheat canopy are discussed. Measurements in laboratory indicate that the loss factor of wheat plants, a function of plant water content, is strongly dependent on the orientation of the plant relative to the polarization direction. Attenuation is more important in vertical than in horizontal polarization. Field measurements show that, depending on wheat variety and development stage, either direct reflection on upper leaves or scattering in the canopy volume can be stated as dominant phenomenon. In the second case, the cloud model can be used to explain strong correlation between radar backscattering coefficient and volumetric water content. In both case, due to relationship between mv and leaf-area-index (LAI) radar backscattering coefficient is found to be related to LAI. Author (ESA)

N84-33883# Kansas Univ. Center for Research, Inc., Lawrence.
DIELECTRIC MEASUREMENTS OF SOILS IN THE 3 TO 37 GHz BAND BETWEEN -50C AND 23C
M. Hallikainen, F. T. Ulaby, M. C. Dobson, and M. El-Rayes *In* ESA IGARSS 84. Remote Sensing: From Res. Towards Operational Use, Vol. 1 Aug. 1984 p 163-168 refs (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

Dielectric constants were measured for 5 soils as a function of temperature in the 3 to 37 GHz range using water contents: 0.05 and 0.25 cucm/cucm. At temperatures above 0C, the dielectric behavior of wet soils is determined by the dispersion behavior of water. The real part and the imaginery part of the dielectric constant for wet soils are compressed versions of those for water. The frequency dependence of the dielectric properties of soils below 0C is considerably smaller than at temperatures above 0C. A fraction of the soil water component remains liquid even at a temperature of -50C. The fraction of unfrozen water increases with increasing clay content of soil. Author (ESA)

N84-33884# Kansas Univ. Center for Research, Inc., Lawrence.
THE DIELECTRIC BEHAVIOR OF SNOW IN THE 3 TO 37 GHz RANGE
M. Hallikainen, F. T. Ulaby, and M. Abdelrazik *In* ESA IGARSS 84. Remote Sensing: From Res. Towards Operational Use, Vol. 1 Aug. 1984 p 169-174 refs (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

Microwave dielectric measurements of dry and wet snow were made at 9 frequencies between 3 GHz and 18 GHz and at 37 GHz using two free-space transmission systems. Parametric ranges covered were: liquid water content: 0 to 12.3 % by volume; snow density: 0.09 to 0.42 g/cucm; temperature: 0 to -5C, and -18C (scattering loss measurements); and crystal size: 0.5 to 1.5 mm. Data indicate that the dielectric behavior of wet snow follows closely the dispersion behavior of water. For dry snow, volume scattering is the dominant loss mechanism at 37 GHz. The applicability of empirical and theoretical mixing models was evaluated using the experimental data. The Debye-like semi-empirical model and the theoretical Polder-Van Santen mixing model are found to adequately describe the dielectric behavior of snow. Author (ESA)

N84-33885# Consiglio Nazionale delle Ricerche, Milan (Italy). Remote Sensing Dept.
FAST AUTOMATIC RECONNAISSANCE IN LAND OBSERVATIONS IMAGES BY MEANS OF ANALOG AND/OR DIGITAL IMAGES
G. M. Lechi, P. Simonelli, R. Rimoldi, and D. Vanetti *In* ESA IGARSS 84. Remote Sensing: From Res. Towards Operational Use, Vol. 1 Aug. 1984 p 177-182 refs (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

A methodology for the comparison of multitemporal environmental surveys and to quantify environmental changes occurring over a period of time, in particular the urban growing of a village and of a middle size town were examined. A preprocessing of two aerial surveys of the village was developed to obtain the same average scale and the images were digitized. The on ground spot size provided square pixels of 75 x 75 cm. The images were classified, giving a result containing only the urban build up. From the direct comparison of the two classified matrixes, a matrix of the differences was obtained, containing only the buildings erected in the period considered. Algorithms to reduce the noise of the images, and to optimize the classification were derived. Software created for the analysis of aerial surveys was applied to two LANDSAT MSS images taken over town, and urban growing was measured. Author (ESA)

N84-33886# Zurich Univ. (Switzerland). Dept. of Geography.
MULTITEMPORAL LANDSAT URBAN AREA CLASSIFICATION
M. F. Baumgartner and K. I. Itten *In* ESA IGARSS 84. Remote Sensing: From Res. towards Operational Use, Vol. 1 Aug. 1984 p 183-186 refs (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

A 20 channel data set consisting of 5 digitally matched LANDSAT MSS scenes of the metropolitan area of Zurich was classified into 9 preselected cover types concurrent to a reduction of the number of input variables. After testing several reducing methods and classification algorithms, a transformation by the Fisher linear discriminant analysis together with a maximum likelihood classification shows best results. Author (ESA)

N84-33887# Centre dÉtude Spatiale des Rayonnements, Toulouse (France).
AUTOMATIC ANALYSIS OF BITEMPORAL LANDSAT DATA: AN APPLICATION TO THE STUDY OF THE EVOLUTION OF VEGETATION-COVERED AREAS IN A TROPICAL REGION
D. Ducros-Gambart and J.-P. Gastellu-Etchegorry *In* ESA IGARSS 84. Remote Sensing: From Res. Towards Operational Use, Vol. 1 Aug. 1984 p 187-192 refs Prepared in cooperation with CNRS, Toulouse and Toulouse Univ. Original contains color illustrations (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

An automatic procedure to study the evolution of tropical vegetation types between two dates is presented. A multidimensional supervised classification (spectral and textural) is carried out separately for the two dates. The textural information is introduced to overcome constraints due to the low dynamic range of the spectral values which made it difficult to separate different landscape units. A geometrical correction program which allows the superposition of the two images is applied. Regions studied have few reference points, due to fuzzy contours between the vegetation types: the program cannot be used in an optimal fashion. The algorithm allows a distinction between the differences due to the evolution of the landscape and those due to the positioning errors which remain in the corrected image. The percentages of the pixels which change between the two dates for the classes chosen and a map of this change are given. Author (ESA)

N84-33888# Aquater S.p.A., San Lorenzo in Campo (Italy).
CROP IDENTIFICATION BY MEANS OF SPECTRAL PROFILES
Giovacchini Aldo *In* ESA IGARSS 84. Remote Sensing: From Res. Towards Operational Use, Vol. 1 Aug. 1984 p 193-196 refs (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

Crop profiles traced by spectral data were analyzed to identify durum wheat, barley, soft wheat, alfa-alfa, sugarbeet and corn during a period from March to July. Multispectral/multitemporal data were collected every 10 to 15 days using a Exotech (Mod. 100) hand held radiometer. Agronomic variables were collected at the same time. Results prove the power of the crop profile techniques to recognize wheat from barley and corn from sugar beet if multispectral data are collected during specific phenological stages. Author (ESA)

N84-33889*# Wageningen Agricultural Univ. (Netherlands).
ESTIMATING NET RAINFALL, EVAPORATION AND WATER STORAGE OF A BARE SOIL FROM SEQUENTIAL L-BAND EMISSIVITIES
L. Stroosnijder, R. J. Lascano (Texas Agricultural Experimental Station, Lubbock), R. W. Newton (Texas A and M Univ., College Station), and C. H. M. vanBavel (Texas A and M Univ., College Station) *In* ESA IGARSS 84. Remote Sensing: From Res. Towards Operational Use, Vol. 1 Aug. 1984 p 197-202 refs Sponsored by Fulbright Scholarship (For primary document see N84-33857 23-43)
(Grant NAG5-31)
Avail: NTIS HC A24/MF A01 CSCL 05B

A general method to use a time series of L-band emissivities as an input to a hydrological model for continuously monitoring the net rainfall and evaporation as well as the water content over the entire soil profile is proposed. The model requires a sufficiently accurate and general relation between soil emissivity and surface moisture content. A model which requires the soil hydraulic properties as an additional input, but does not need any weather data was developed. The method is shown to be numerically consistent. Author (ESA)

N84-33890# Centre National de la Recherche Scientifique, Garchy (France). Centre de Recherches Geophysiques.
EVALUATION OF THE USE OF THERMAL AIRBORNE PROSPECTION FOR ARCHAEOLOGY DURING THE LAST 10 YEARS
A. Tabbagh *In* ESA IGARSS 84. Remote Sensing: From Res. towards Operational Use, Vol. 1 Aug. 1984 p 205-208 refs (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

Thermal remote sensing was used to study ancient landscapes and archaeological features in France, using the scanner radiometer ARIES. Temperature differences that appear on soil surface in connection with archeological remains come from microrelief effects and from variations in the soil thermal properties. Study of these properties, calculation of slow transient in flux variation and the building up of theoretical three dimensional models were necessary for interpretation of results and for forecasting the most favorable time for measuring. Successes are obtained in various conditions in detecting local features and determining the ancient general landscape organization. This method is also satisfactory for describing the superficial geological context. Author (ESA)

N84-33891*# National Aeronautics and Space Administration, Washington, D. C. Land Processes Branch.
AN ANALYSIS OF THE EFFECT OF BIOLOGICAL AND PHYSICAL PARAMETERS OF A WETLANDS GRASS BIOME ON THE SPECTRAL MODELING OF PHYTOMASS AND PRIMARY PRODUCTIVITY
M. Kristine Butera and Amanda Frick *In* ESA IGARSS 84. Remote Sensing: From Res. Towards Operational Use, Vol. 1 Aug. 1984 p 209-216 refs (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01 CSCL 05B

Aircraft simulated thematic mapper data and field data were acquired in the fall and spring to analyze the relationship of spectral response and biomass for the marsh grass Spartina patens. Regression results indicate no simple relationship exists for TMS spectral response and biomass with a high R sq. However, results show a consistent relationship between spectral response and the percent live vegetation (by weight) and percent interstitial standing surface water (by area) as independent variables. It is suggested that the reflected energy of a pixel represents a mixture of surface constituents. It is recommended that alternative remote sensors be employed to account for the pixel constituents of live and dead vegetation, litter, and standing water. Author (ESA)

N84-33892# Freiburg Univ. (West Germany). Abteilung Luftbildmessung und Fernerkundung.
INVESTIGATION OF SPECTRAL SIGNATURES OF DIFFERENTLY DAMAGED TREES AND FOREST STANDS
A. Kadro *In* ESA IGARSS 84. Remote Sensing: From Res. Towards Operational Use, Vol. 1 Aug. 1984 p 217-221 refs Original contains color illustrations (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

The spectral reflection behavior of forest vegetation, especially the difference between healthy and damaged trees and stands, was investigated using visual, near infrared, and middle infrared data collected from different flight altitudes. A computer aided classification method for forest stand damage inventory was derived. Spectral signatures show clear differences between healthy and damaged trees. The computer classification scheme is substantiated by subjective photointerpretation, but it misclassifies beech as healthy fir or spruce. Author (ESA)

N84-33893# Indian Space Research Organization, Bangalore.
AN APPROACH FOR AGRICULTURAL DROUGHT MONITORING USING NOAA/AVHRR AND LANDSAT IMAGERY
P. P. Nageswara Rao and V. R. Rao *In* ESA IGARSS 84. Remote Sensing: From Res. Towards Operational Use, Vol. 1 Aug. 1984 p 225-229 refs (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

An approach for preparing an indicative drought map showing the areas of high probability of drought based on rainfall estimation at the seedling stage of crop growth using NOAA/AVHRR imagery is discussed. The indicative drought map can be used for initiating relief measures early in the crop growing season. The AVHRR band 3 (3.55 to 3.93 microns) is useful in delineating broad categories of drought affected areas. Severity of the drought affect between two different regions was assessed using LANDSAT imagery. This approach was tried for the drought year 1982 in the Southern peninsular part of India. Good correlation between satellite rainfall estimates and ground observations is reported. Author (ESA)

N84-33894# IBM France S. A., Paris. Centre Scientifique.
INTERPRETATION OF COMBINED LANDSAT-HEAT CAPACITY MAPPING MISSION (HCMM) DATA FOR GEOLOGICAL ANALYSIS. EVALUATION OF SCALE EFFECT ON INTERPRETATION OF A MULTISOURCE IMAGE [INTERPRETATIONS DES DONNEES HCMM ET LANDSAT COMBINES POUR L'ANALYSE GEOLOGIQUE. EVALUATION D'UN EFFET D'ECHELLE EN INTERPRETATION D'IMAGE MULTI-SOURCES]
Y. Rabu, M. Abrams, W. Niblack, and J. Chorowicz (Paris VI Univer.) *In* ESA IGARSS 84. Remote Sensing: From Res. Towards Operational Use, Vol. 1 Aug. 1984 p 231-236 refs In FRENCH Original contains color illustrations (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

LANDSAT multispectral scanner images were combined with heat capacity mapping mission (HCMM) night infrared and thermal inertia images to produce a geological map. Quantitative evaluation using Bayesian maximum likelihood estimates shows the benefits of adding the images. Night infrared images are more useful than thermal inertia. All processing manipulations can be done on a small scale, before resampling using a more precise scale. Data with an original geometric resolution of 600 m can be exploited at 80 m. Vegetation is not the dominant factor in the variability of the spectral response. Author (ESA)

N84-33895# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Hochfrequenztechnik.
COMPARATIVE GEOLOGIC ANALYSIS OF LANDSAT AND SCHUTTLE IMAGING RADAR (SIR)-A IMAGES OF THE ADRAR

DES IFORAS AREA IN NE MALI

A. Sieber and B. Theilen-Willige (Technische Universitaet, Clausthal-Zellerfeld, West Germany) *In* ESA IGARSS 84. Remote Sensing: From Res. Towards Operational Use, Vol. 1 Aug. 1984 p 237-239 refs (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

Geologic evaluations and mappings based on Shuttle Imaging Radar (SIR-A) images are compared with geologic maps to demonstrate the value of spaceborne radar images for providing additional geologic information. Comparative geologic evaluations of LANDSAT and SIR-A images demonstrate that SIR-A images contain more lithologic and structural information than LANDSAT images. Due to the capability of radar signals to penetrate through thin sedimentary layers into the subsurface, lithologic units and tectonic features become visible on SIR-A images that are unattainable on LANDSAT images and on aerial photographs.
Author (ESA)

N84-33896# Canada Centre for Remote Sensing, Ottawa (Ontario).

ON THE SAR RESPONSE OF AGRICULTURAL TARGETS IN A NORTHERN PRAIRIE ENVIRONMENT

J. Cihlar and T. Hirose (FG Bercha and Associates, Ltd.) *In* ESA IGARSS 84. Remote Sensing: From Res. Towards Operational Use, Vol. 1 Aug. 1984 p 241-249 refs (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

Relationships between SAR backscatter and parameters describing agricultural cover types in a northern prairie environment were studied, and digital classification accuracies for these types derived from individual pixel values were compared to those derived from mean field intensities. Single date digital airborne X and L-band data, SEASAT data, and LANDSAT MSS data were analyzed for four agricultural sites. Results indicate the importance of cover type for determining SAR backscatter and the ability of SAR data to accurately separate cover types. Classification employing field means yields higher overall accuracies. However, it is not possible to consistently relate SAR image tone to target parameters, partly due to limitations of supporting data. Author (ESA)

N84-33897*# Coast Guard, Washington, D.C. Office of Research and Development.

CORRELATION OF MICROWAVE SENSOR RETURNS WITH SOIL MOISTURE

D. W. Taube and S. W. Theis (Technology Service Corp., Silver Spring, Md.) *In* ESA IGARSS 84. Remote Sensing: From Res. Towards Operational Use, Vol. 1 Aug. 1984 p 251-256 refs Sponsored by US Geological Service and USDA (For primary document see N84-33857 23-43)
(Grant NSG-5134; Contract MO-A01-004332)
Avail: NTIS HC A24/MF A01 CSCL 08M

Microwave sensor soil data were collected by aircraft over agricultural croplands. Multiple incident angle scatterometer data (13.3, 4.75, 1.6 and 0.4 GHz), passive radiometer data (L and C-band), and soil moisture ground truth measurements were collected coincidentally. Each sensor and angle of incidence was linearly analyzed against the measured soil moisture. For bare agricultural soils, the optimal single sensor for soil moisture preduction is the L-band passive radiometer. The effects of vegetation and differing surface roughness prove significant. When both bare and vegetated surfaces were studied, the masking due to the vegetation renders the single sensor approach ineffective in soil moisture prediction. Multisensor techniques are necessary to remotely measure soil moisture when a priori knowledge of vegetation is not available. Author (ESA)

N84-33898*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

UTILIZATION OF ACTIVE MICROWAVE ROUGHNESS MEASUREMENTS TO IMPROVE PASSIVE MICROWAVE SOIL MOISTURE ESTIMATES OVER BARE SOILS

S. W. Theis (Technology Service Corp., Silver Spring, Md.), B. J. Blanchard, and A. J. Blanchard (Texas University, Arlington) *In* ESA IGARSS 84. Remote Sensing: From Res. Towards Operational Use, Vol. 1 Aug. 1984 p 257-262 refs Sponsored by US Geological Service and USDA (For primary document see N84-33857 23-43)
(Grant NSG-5134; Contract MO-A01-004332)
Avail: NTIS HC A24/MF A01 CSCL 08M

Multisensor aircraft data were used to establish the potential of the active microwave sensor response to be used to compensate for roughness in the passive microwave sensor's response to soil moisture. Only bare fields were used. It is found that the L-band radiometer's capability to estimate soil moisture significantly improves when surface roughness is accounted for with the scatterometers. Author (ESA)

N84-33899# Technische Univ., Munich (West Germany). Inst. for General and Applied Geology.

THE APPLICABILITY OF IMPROVED REMOTE SENSING DATA FOR LITHOLOGICAL AND STRUCTURAL MAPPING

F. Jaskolla and H. Kaufmann *In* ESA IGARSS 84. Remote Sensing: From Res. Towards Operational Use, Vol. 1 Aug. 1984 p 265-271 refs (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

The use of advanced sensors characterized by improved ground pixel sizes and an increasing number of spectral bands in structural and lithological mapping is discussed. It is demonstrated that NASA's Thematic Mapper is the most sophisticated Earth sensing capability, although the possibilities of stereoscopic data acquisition are very limited. To overcome this insufficiency, the possibilities of improved sensors based on CCD technology must be considered, since they sample multispectral and stereoscopic data simultaneously. Author (ESA)

N84-33900# Consiglio Nazionale delle Ricerche, Frascati (Italy). Ist. Astrofisica Spaziale.

AN INTERACTIVE PROCEDURE FOR THE ANALYSIS OF LINEAR ELEMENTS DETECTED IN LANDSAT PICTURES: AN APPLICATION TO NORTHERN MOZAMBIQUE

T. Cirillo (Ordine Nazionale dei Geologi, Rome) and M. Poscolieri *In* ESA IGARSS 84. Remote Sensing: From Res. Towards Operational Use, Vol. 1 Aug. 1984 p 273-280 refs (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

The lineaments of Northern Mozambique were studied using LANDSAT imagery. A procedure for analysing these features, on the basis of their orientation and length, in both the whole area and 1 deg sq sized subsets of it was developed. Once regional azimuthal trends were identified, numerical parameters, measuring the presence of these domains in each cell were derived. These values, shown by contour maps, reveal the structures controlling the lineaments and could be processed for mineral target detection. Author (ESA)

N84-33901# Technical Univ. of Denmark, Lyngby.

STATISTICAL LINEAMENT ANALYSIS IN SOUTH GREENLAND BASED ON LANDSAT IMAGERY

K. Conradsen, G. Nilsson, and T. Thysted (Geological Survey of Denmark) *In* ESA IGARSS 84. Remote Sensing: From Res. towards Operational Use, Vol. 1 Aug. 1984 p 281-287 refs (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

Linear features, mapped visually from one-channel photoprints (1:1,000,000) of LANDSAT images from South Greenland, were digitized and analyzed statistically. A sinusoidal curve was fitted to the frequency distribution, dividing it into 10 significant classes of directions. Geographically, many of the classes are distributed in zones of geological significance. Zones coincide with geochemical boundaries and graben structures and the crossing points between zones control intrusion sites. Author (ESA)

N84-33902# Delhi Univ. (India). Dept. of Geology.

STUDIES IN ENVIRONMENTAL GEOMORPHOLOGY OF DUDHATOLI RIDGE GARHWAL, HIMALAY, INDIA

C. Prasad, R. R. Sundriyal, and V. K. Verma *In* ESA IGARSS

84. Remote Sensing: From Res. towards Operational Use, Vol. 1 Aug. 1984 p 289-294 refs Sponsored by Indian Department of Environment Prepared in cooperation with Garhwal Univ., India (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

Dudhatoli Ridge (Himalayas) landforms, vegetation, and soil cover were studied via aerial photograph and LANDSAT images, and field checks. The central part of this ridge is a dome occupied by granitic rocks. It is cut accross by a strong lineament, indicating recent tectonic movement along the axis of this synform. This dome is largely without any vegetation and has very thin soil cover, whereas its margins are densely forested, with rich soils. The central part of the ridge is subjected to considerable mass wastings, aided by the presence of crushed rocks along the zone of recent tectonic dislocation. This is further evidenced by the presence of recent colluvial deposits on the sides of the dome.
Author (ESA)

N84-33903# Bonn Univ. (West Germany).
A SPLASH AND SHEET EROSION MODEL FROM LANDSAT DATA
M. C. Mueksch *In* ESA IGARSS 84. Remote Sensing: From Res. towards Operational Use, Vol. 1 Aug. 1984 p 295-299 refs (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

A splash erosion model from LANDSAT data, using linear measurements of slope length, is presented. Relief data and rain intensity are introduced by relationships between slope length and slope inclination from empirically gained formulas and climatological observations. By setting the soil loss equal to the sediment splashed, an erosion factor is computed for a map delineated area and its respective satellite scene from which a transition factor to the reality is related. The soil loss on different slope profiles, the total soil loss, soil constants and the relative splash and sheet erosion are edited for various rainfall intensities and removed vegetation canopy, i.e., increased bare soil surface and vegetation damage. The model works as a quick-look procedure for estimation of quantitative regional erosion and its development.
Author (ESA)

N84-33904# Freiburg Univ. (West Germany).
CALCULATION OF FLOOD HYDROGRAPHS USING SATELLITE-DERIVED LAND-USE INFORMATION IN THE DREISAM WATERSHED, S. W. GERMANY
W. Mauser *In* ESA IGARSS 84. Remote Sensing: From Res. towards Operational Use, Vol. 1 Aug. 1984 p 301-304 refs (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

Flood hydrographs in a watershed were calculated using a geographical data base including satellite derived land use, soil information and slope with a resolution of 64x104 m. The land use information is a result of a maximum likelihood classification of LANDSAT MSS data. As model for the calculation of the flood hydrographs the SCS-TR 20 was used. The single event calculations and calculations using 24-hr storms of selected return periods match the measured hydrographs well. The effect of a possible deforestation of the area due to forest damage was simulated using five scenarios. According to the simulations a total deforestation in the watershed will cause a 100-yr peak discharge 5 times as high as todays.
Author (ESA)

N84-33905# Johns Hopkins Univ., Laurel, Md. Applied Physics Lab.
THE INFORMATION CONTENT OF SPACEBORNE SAR OCEAN IMAGE SPECTRA
T. W. Gerling, R. C. Beal, and D. G. Tilley *In* ESA IGARSS 84. Remote Sensing: From Res. towards Operational Use, Vol. 1 Aug. 1984 p 307-314 refs Original contains color illustrations (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

The signatures of wave systems and the wind field in digitally processed SEASAT SAR imagery and spectra are discussed. Results indicating evidence of waves in the several hundred meter range of spectra properly corrected for various contaminating effects are reviewed. Wind field signatures are found in the several kilometer scale spectral range, and are typically manifested through higher correlation downwind. The resulting spectral asymmetry is used to estimate wind directions from SEASAT Pass 1339 SAR spectra which are compared with other measurements. Roll vortices are discussed as a basis for this signature, and spectral processing techniques used to enhance the often subtle and noisy signatures are considered.
Author (ESA)

N84-33906# Hamburg Univ. (West Germany). Inst. fuer Meereskunde.
A THREE-DIMENSIONAL DESCRIPTION OF THE SEA SURFACE BY MEANS OF MARINE NAVIGATION RADAR
I. R. Young and F. Ziemer *In* ESA IGARSS 84. Remote Sensing: From Res. towards Operational Use, Vol. 1 Aug. 1984 p 315-319 refs Sponsored by Deutsche Forschungsgemeinschaft (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

A series of radar images, each taken at consecutive sweeps of the antenna of a conventional marine radar, is analyzed to determine the three-dimensional spectrum of ocean waves. The directional spectrum of the waves is shown to agree with results of conventional pitch-roll buoy measurements. The three-dimensional analysis also gives information concerning the phase velocity of the waves. Any deviations from the theoretical dispersion relationship can be assumed to be the result of a surface current. A least squares technique to determine the magnitude and direction of such a current is developed.
Author (ESA)

N84-33907# Ministry of Posts and Telecommunications, Tokyo (Japan). Radio Research Labs.
MEASUREMENTS OF MICROWAVE BACKSCATTERING SIGNATURES OF THE OCEAN SURFACE USING X-BAND AND Ka-BAND AIRBORNE SCATTEROMETER/RADIOMETER SYSTEM
Harunobu Masuko, Kenichi Kamoto, Shin Yoshikado, Toshio Takasugi, Masanobu Shimada (National Space Development Agency, Ibaraki, Japan), Hiroyoshi Yamada (National Space Development Agency, Ibaraki, Japan), and Shuntaro Niwa (National Space Development Agency, Ibaraki, Japan) *In* ESA IGARSS 84. Remote Sensing: From Res. towards Operational Use, Vol. 1 Aug. 1984 p 321-326 refs (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

An airborne microwave scaterrometer/radiometer system operated at X-band (3 cm) and Ka-band (8.7 mm) was applied to the observations of microwave scattering signatures of the ocean. The differential backscattering cross sections were measured as combined functions of frequency (10.00 GHz and 34.43 GHz), polarization (HH and VV), wind speed (3.2 to 17.2 m/sec), azimuth angle (0 to 360 deg), and incident angle (0 to 70 deg). The azumithal anisotropic features for Ka-band are similar to those for X-band, and the wind speed dependence is analyzed for each azimuth angle, polarization, and incident angle. For each parameter, behavior of the backscattering cross section for microwave frequencies are compared with previous results. The relations of the microwave scattering signatures and ocean wave spectrum are discussed.
Author (ESA)

N84-33908# Johns Hopkins Univ., Laurel, Md. Applied Physics Lab.
COMPARISON OF OCEAN WAVE ENERGY MEASURED BY SEASAT SYNTHETIC APERTURE RADAR WITH SAR SURFACE WAVE IMAGING THEORIES
Frank M. Monaldo and Robert C. Beal *In* ESA IGARSS 84. Remote Sensing: From Res. towards Operational Use, Vol. 1 Aug. 1984 p 327-332 refs (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

Correlation between the dominant wavelength and propagation direction of the SAR image spectrum and the actual ocean surface dominant wavelength and direction is discussed. The relationship between the SAR image spectrum energy and the

mean square ocean wave-height or wave-slope spectrum is considered. The correlation of SAR image spectral energy with independent measurements of the ocean surface spectrum for SEASAT pass 1339 off the east coast of the United States suggests at least a systematic relationship between the two.
Author (ESA)

N84-33909# Sofia Univ. (Bulgaria). Inst. of Electronics.
REMOVAL OF AMBIGUITY OF TWO-DIMENSIONAL GRAY LEVEL VARIANCE SPECTRA OBTAINED BY PROCESSING SHIP RADAR IMAGES OF OCEAN WAVES
V. Atanassov, W. Rosenthal (Max-Planck Institut fuer Meteorologie, Hamburg), and E. Ziemer (Deutsches Hydrographisches Inst.) *In* ESA IGARSS 84. Remote Sensing: From Res. towards Operational Use, Vol. 1 Aug. 1984 p 333-336 refs (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

An analysis that generates nonsymmetric waves spectra from two successive radar images providing a unique wave direction for each spectral component is presented. The method resolves the 180 deg ambiguity in conventional spatial Fourier transform derived from a frozen sea surface. The technique may substitute three-dimensional Fourier analysis of sequential wave images especially where only a limited number of images from the same area can be taken in sequence, e.g., in cases of an airborne or spaceborne radar. Author (ESA)

N84-33910*# National Aeronautics and Space Administration, Washington, D. C.
REMOTE SENSING OF THE MARGINAL ICE ZONE DURING MARGINAL ICE ZONE EXPERIMENT (MIZEX) 83
R. A. Shuchman (ERIM), W. J. Campbell (USGS), B. A. Burns (ERIM), E. Ellingsen (MTNFR), B. A. Farrelly (Bergen Univ.), P. Gloersen, T. C. Grenfell (Washington Univ.), J. Hollinger (NRL), D. Horn (ONR), J. A. Johannessen (Bergen Univ.) et al *In* ESA IGARSS 84. Remote Sensing: From Res. towards Operational Use, Vol. 1 Aug. 1984 p 339-346 refs (For primary document see N84-33857 23-43)
(Contracts N00014-83-C-0404; N00014-82-C-0063)
Avail: NTIS HC A24/MF A01

The remote sensing techniques utilized in the Marginal Ice Zone Experiment (MIZEX) to study the physical characteristics and geophysical processes of the Fram Strait Region of the Greenland Sea are described. The studies, which utilized satellites, aircraft, helicopters, and ship and ground-based remote sensors, focused on the use of microwave remote sensors. Results indicate that remote sensors can provide marginal ice zone characteristics which include ice edge and ice boundary locations, ice types and concentration, ice deformation, ice kinematics, gravity waves and swell (in the water and the ice), location of internal wave fields, location of eddies and current boundaries, surface currents and sea surface winds. Author (ESA)

N84-33911# Environmental Research Inst. of Michigan, Ann Arbor. Radar Div.
SAR MEASUREMENT OF SEA ICE PROPERTIES DURING MARGINAL ICE ZONE EXPERIMENT (MIZEX) 83
B. A. Burns, R. A. Shuchman, P. L. Jackson, J. D. Lyden, and C. E. Livingstone (Canada Centre for Remote Sensing, Ottawa) *In* ESA IGARSS 84. Remote Sensing: From Res. towards Operational Use, Vol. 1 Aug. 1984 p 347-351 refs (For primary document see N84-33857 23-43)
(Contracts N00014-83-C-0404; N00014-82-C-0063)
Avail: NTIS HC A24/MF A01

Dual frequency and dual polarization synthetic aperture radar (SAR) data of the Greenland Sea-Fram Strait marginal ice zone (MIZ) was collected in Summer during the Marginal Ice Zone Experiment (MIZEX). The active microwave 3m resolution data provide synoptic information on ocean/ice interaction phenomena including eddy formation, gravity waves, and transition of ice zones. The SAR mosaics collected during MIZEX were used to provide quantitative information on geophysical parameters of the MIZ such as ice kinematics, ice concentration, floe size distribution, and ice type. Author (ESA)

N84-33912# Naval Research Lab., Washington, D. C.
MILLIMETER WAVE RADIOMETRIC IMAGES OF THE MARGINAL ICE ZONE
J. P. Hollinger, M. R. Keller (Computer Sciences Corp., Silver Spring, Md.), C. A. Luther (ONR, Arlington, Vir.), and R. O. Ramseier (Department of the Environment, Ottawa) *In* ESA IGARSS 84. Remote Sensing: From Res. towards Operational Use, Vol. 1 Aug. 1984 p 353-358 refs (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

Airborne radiometric imaging measurements at 90, 135, and 216 GHz over the marginal ice zone in the Greenland Sea were obtained in July. A 130 by 130 km area was mapped at 90 GHz from 7.6 km. High resolution images were obtained from 900m at 90 and 140 GHz of selected regions. The large area images provide information on ice type, motion, and concentration. The low altitude imagery provides details of ice structure. Emissivities of summer ice differ from typical winter values because of wet snow cover. Ice concentrations calculated from satellite and aircraft data agree except at the edge, because of the large satellite footprint.
Author (ESA)

N84-33913# Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.
ACTIVE MICROWAVE MEASUREMENTS OF SEA ICE IN THE MARGINAL ICE UNDER SUMMER CONDITIONS
R. G. Onstott and R. K. Moore *In* ESA IGARSS 84. Remote Sensing: From Res. towards Operational Use, Vol. 1 Aug. 1984 p 359-363 refs (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

Radar backscatter from sea ice during summer melt in the marginal ice zone between East Greenland and Spitzbergen was measured. Data were acquired using a ship-based and helicopter-borne scatterrometer at frequencies between 4 and 18 GHz, at angles from 10 deg to 83 deg from vertical, and with like-and cross-antenna polarizations. Sensor-oriented ice characterization measurements were also made. Scattering coefficients of the major ice types in the region were obtained. The influence of summer melt on ice conditions and the radar response was studied. There were three major ice types: first-year, thick first-year, and multiyear. Thick ice often shows significant deformation. Ice features covered by snow are masked and exhibit low backscatter, while those with or without firn produce higher backscatter. Author (ESA)

N84-33914# Bergen Univ. (Norway). Inst. of Geophysics.
EDDY STUDIES DURING MARGINAL ICE ZONE EXPERIMENT (MIZEX) 83 BY SHIP AND REMOTE SENSING OBSERVATIONS
O. M. Johannessen, J. A. Johannessen, B. A. Farrelly, K. Kloster (Chr. Michelsens Inst., Bergen), and R. H. Schuchman (Enviromnental Research Inst. of Michigan, Ann Arbor) *In* ESA IGARSS 84. Remote Sensing: From Res. towards Operational Use, Vol. 1 Aug. 1984 p 365-368 refs Sponsored by Office of Naval Research, Royal Norwegian Council for Scientific and Industrial Research and Norwegian Research Council for Science and the Humanities Original contains color illustrations (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

Synoptic studies were carried out of the ocean-ice eddy located over a deep bathymetric depression, the Molloy Deep centered at 79 deg 08'N and 3 deg E. This eddy was studied using conventional and helicopter conductivity/temperature/depth stations, XBT's and towed sensors from ships, SAR and passive microwave observations from two remote sensing aircraft, visual and IR images from NOAA satellites, AXBT's from a third aircraft and ARGOS drifting buoys located on ice floes with current meters below. The observations indicated that this eddy with a scale of 60 km is topographically generated and possible trapped by the bathymetric depression extending down to more than 5000m depth. Smaller eddies of 10 to 20 km length scale are generated around the boundary of the larger one. Author (ESA)

N84-33915# Chr. Michelsen Inst., Bergen (Norway).
MAPPING THE FRAM STRAIT ICE EDGE USING AVHRR IMAGERY AND NOAA SATELLITE ORBITAL DATA
K. Kloster and B. A. Farrelly (Bergen Univ.) *In* ESA IGARSS 84. Remote Sensing: From Res. towards Operational Use, Vol. 1 Aug. 1984 p 369-372 refs (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

About 30 images from the NOAA-7 and NOAA-8 satellite AVHRR instruments from the Fram Strait in June and July were used to map ice albedo and sea surface temperature. The geographical gridding procedure used to produce overlay grids is described. The procedure is based on knowledge of satellite orbital data combined with accurate time for the scan lines. The resulting grid accuracy is good on scan-line direction, but serious errors occur in the nadir-line direction. Accurate maps of Svalbard and Greenland coastlines are used for corrections. An example of ice trajectory mapping is described. Author (ESA)

N84-33916*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md. Goddard Lab. for Atmospheric Sciences.
OBSERVATION OF VARIATIONS IN THE COMPOSITION OF SEA ICE IN THE GREENLAND MIZ DURING EARLY SUMMER 1983 WITH THE NIMBUS-7 SMMR
Per Gloersen and William J. Campbell (Puget Sound Univ., Tacoma) *In* ESA IGARSS 84. Remote Sensing: From Res. towards Operational Use, Vol. 1 Aug. 1984 p 373-378 refs Sponsored by ONR (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01 CSCL 08M

Data acquired with the Scanning Multichannel Microwave Radiometer (SMMR) on board the Nimbus-7 Satellite for a six-week period in Fram Strait were analyzed with a procedure for calculating sea ice concentration, multiyear fraction, and ice temperature. Calculations were compared with independent observations made on the surface and from aircraft to check the validity of the calculations based on SMMR data. The calculation of multiyear fraction, which was known to be invalid near the melting point of sea ice, is discussed. The indication of multiyear ice is found to disappear a number of times, presumably corresponding to freeze/thaw cycles which occurred in this time period. Author (ESA)

N84-33917*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PASSIVE MICROWAVE CHARACTERISTICS OF THE BERING SEA ICE COVER DURING MARGINAL ICE ZONE EXPERIMENT (MIZEX) WEST
D. J. Cavalieri, P. Gloersen, T. T. Wilheit, and C. Calhoon *In* ESA IGARSS 84. Remote Sensing: From Res. towards Operational Use, Vol. 1 Aug. 1984 p 379-384 refs (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01 CSCL 08M

Passive microwave measurements of the Bering Sea were made with the NASA CV-990 airborne laboratory during February. Microwave data were obtained with imaging and dual-polarized, fixed-beam radiometers in a range of frequencies from 10 to 183 GHz. The high resolution imagery at 92 GHz provides a particularly good description of the marginal ice zone delineating regions of open water, ice compactness, and ice-edge structure. Analysis of the fixed-beam data shows that spectral differences increase with a decrease in ice thickness. Polarization at 18 and 37 GHz distinguishes among new, young, and first-year sea ice types. Author (ESA)

N84-33918# Washington Univ., Seattle. Dept. of Atmospheric Sciences.
SURFACE BASED BRIGHTNESS TEMPERATURES OF SEA ICE IN THE BERING AND GREENLAND SEAS
T. C. Grenfell *In* ESA IGARSS 84. Remote Sensing: From Res. towards Operational Use, Vol. 1 Aug. 1984 p 385-389 refs (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

Brightness temperatures of sea ice was measured during the Marginal Ice Zone Experiment (MIZEX) field experiments in February in the Bering Sea and in June/July in the northern Greenland Sea. In the Bering Sea thin growing sea ice types from black ice to 40 cm thick snow covered floes were investigated. Brightness temperatures increase with ice thickness up to 10 cm from values of 100 K for open water to as high as 250 K (ϵ = 0.97) for thick ice, and a moderate dependence on snow thickness is found. In the Greenland Sea thick first and multiyear (FY, MY) ice types were studied. Brightness temperatures vary, depending on the daily melt-freeze cycle superimposed on the seasonal warming, ranging from near blackbody values for melting conditions to multiyear-like spectra when the surface layers refroze. The melt season was sufficiently advanced, however, that FY and MY ice could not be differentiated radiometrically. Author (ESA)

N84-33919# Bergen Univ. (Norway). Inst. of Geophysics.
SEASONAL ICE VARIATION IN THE BARENTS SEA OBTAINED FROM THE NIMBUS 7 SCANNING MULTICHANNEL MICROWAVE RADIOMETER (SMMR) OBSERVATIONS
Tor Olaussen, Ola M. Johannessen, and Einar Svendsen *In* ESA IGARSS 84. Remote Sensing: From Res. towards Operational Use, Vol. 1 Aug. 1984 p 391-393 refs Sponsored by Norwegian Committee for Industrial and Scientific Research and ONR (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

The seasonal ice variation in the Barents Sea for 1978/1979 was derived using the NORSEX sea ice algorithm on Nimbus 7 Scanning Multichannel Microwave Radiometer observations. Case studies of the ice edge variation and ice concentration are studied in relation to atmospheric and oceanic conditions. Concentration plots show that there is virtually no multiyear ice present in the Barents Sea throughout the year. Quite often, unaccountably large negative multiyear values show up. These are believed to be caused by a very thin layer of newly formed ice, a situation not taken into account in the algorithm, thus underestimating the total ice concentration and overestimating the first year ice concentration. However, these may enable a distinction between ice edge advance due to new ice formation and ice edge advance due to wind-forcing to be made. Author (ESA)

N84-33920# Bergen Univ. (Norway). Inst. of Geophysics.
THE DISTRIBUTION OF ICE CONCENTRATION, MULTIYEAR AND FIRST YEAR FRACTION IN THE ARCTIC OCEAN DERIVED FROM THE NIMBUS 7 SCANNING MULTICHANNEL MICROWAVE RADIOMETER (SMMR) OBSERVATIONS
Einar Svendsen, Ola M. Johannessen, and Tor Olausen *In* ESA IGARSS 84. Remote Sensing: From Res. towards Operational Use, Vol. 1 Aug. 1984 p 395-397 refs Sponsored by Norwegian Committee for Industrial and Scientific Research and ONR (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

Based on the NORSEX ice algorithms for retrieving total ice concentration, multiyear, and first year fraction from the Nimbus 7 Scanning Multichannel Microwave Radiometers, ice maps are produced through an annual cycle. Features of the ice edge are discussed. The algorithm works well in all parts of the Arctic when the ice surface is dry. During the summer melt season, the amount of multiyear ice cannot be estimated due to the wet snow on the ice. However, the total ice concentration estimates seem reasonable also for this season, except when large amounts of melt ponds exist. These melt ponds are estimated as open water. Author (ESA)

N84-33921# Bergen Univ. (Norway). Dept. of Oceanography.
EVALUATION OF WIND ESTIMATES OVER OPEN OCEAN FROM THE NIMBUS 7 SCANNING MULTICHANNEL MICROWAVE RADIOMETER
Einar Svendsen *In* ESA IGARSS 84. Remote Sensing: From Res. towards Operational Use, Vol. 1 Aug. 1984 p 399-402 refs Sponsored by Norwegian Meteorological Institute (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

The polarization ratio (PR) defined as the difference divided by the sum of vertical and horizontal polarized brightness temperatures measured from the Nimbus 7 Scanning Multichannel Microwave Radiometers at 17.7 GHz and ship measured winds (W) are used to derive a linear algorithm for wind retrievals: W = 104.5 - 411.5 . PR10.7 m/sec. Theoretical studies of PR indicate that variations in sea surface temperature have negligible effects on the retrievals. The empirical results give a standard error of estimate of 2 m/sec. The theory, however, shows that variation in the atmosphere should cause greater variations than 2 m/sec, which indicated that atmospheric and wind effects on PR are correlated. Author (ESA)

N84-33922*# Centre National d'Etudes Spatiales, Toulouse (France).
COMPARISON OF SEA SURFACE WIND SPEED FIELDS BY SEASAT RADAR ALTIMETER, SCATTEROMETER AND SCANNING MULTICHANNEL MICROWAVE RADIOMETER WITH AN EMPHASIS ON THE SOUTHERN OCEAN
Nelly M. Mognard and William J. Campbell (Puget Sound Univ., Tacoma) *In* ESA IGARSS 84. Remote Sensing: From Res. towards Operational Use, Vol. 1 Aug. 1984 p 403-409 refs Sponsored by NASA Goddard Space Flight Center and ESA (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

The SEASAT altimeter (ALT), scatterometer (SASS), and scanning microwave multichannel radiometer (SMMR) measured sea surface wind speed. During the satellite lifetime from June to October 1978, the Austral winter, the highest wind speeds were recorded in the Southern Ocean. Three-month, monthly, and three-day surface wind speed fields deduced from the three Seasat wind speed sensors are compared. The monthly and three-day fields show a pronounced mesoscale (1000 km) variability in wind speed. At all space and time scales analyzed, differences of 40% are found in the magnitude of the wind speed features, with the ALT consistently yielding the lowest wind speed and the SMMR the highest. Author (ESA)

N84-33923*# Massachusetts Inst. of Tech., Cambridge. Research Lab. of Electronics.
PASSIVE MICROWAVE REMOTE SENSING OF THE ATMOSPHERE FROM SATELLITES
David H. Staelin *In* ESA IGARSS 84. Remote Sensing: From Res. towards Operational Use, Vol. 1 Aug. 1984 p 413-415 refs (For primary document see N84-33857 23-43)
(Grant NAG5-10)
Avail: NTIS HC A24/MF A01 CSCL 05B

Present and future satellite atmospheric sounding is discussed. Although present systems sound principally the temperature profile and the water vapor and precipitation abundances over ocean, future systems will measure other constituents such as O3, H2O2, and ClO, and will provide improved spatial resolution, retrieval accuracy, and altitude coverage for temperature and humidity. Present systems with only a few channels will be replaced by systems with 20 or more, and larger antennas with more sensitive radiometers will permit horizontal resolutions of 15 to 50 km or less, even from geosynchronous orbit. The success of imaging microwave spectrometers in penetrating clouds and in yielding uniquely accurate measurements ensure a growing role in operational and research systems for these remote sensing techniques. Author (ESA)

N84-33924# National Environmental Satellite Center, Washington, D. C.
PRECIPITATION MONITORING OVER LAND FROM SATELLITES BY MICROWAVE RADIOMETRY
N. C. Grody *In* ESA IGARSS 84. Remote Sensing: From Res. towards Operational Use, Vol. 1 Aug. 1984 p 417-422 refs Original contains color illustrations (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

Accomplishments and future opportunities of passive microwaves in deriving precipitation over land are summarized. Techniques which enhance the precipitation signature by minimizing the effect of surface emissivity on the microwave measurements are presented. Data from the Nimbus-7 scanning multichannel microwave radiometer are shown. Dual polarization or dual frequency measurements enhance the precipitation signature by reducing the effect of surface emissivity on the brightness temperature observations. Surface features such as snow, ice and wet land can be identified. Author (ESA)

N84-33925# Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Electron Physics.
GROUND-BASED REMOTE SENSING OF TEMPERATURE AND WATER VAPOR BY PASSIVE MICROWAVE RADIOMETERS
J. Askne *In* ESA IGARSS 84. Remote Sensing: From Res. towards Operational Use, Vol. 1 Aug. 1984 p 423-429 refs Sponsored by Swedish Board for Space Activities and Swedish Space Co. (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

Ground-based microwave radiometry is discussed, and results of a temperature-profiling radiometer tested in the ONSAM-experiment are described. The results of the ONSAM-period indicate that observations at 11 frequencies yield a better result than observations at only 4. It is not meaningful to try to achieve much better absolute accuracy than the present system, i.e., 0.5 K. It is very important to observe the same air mass with the water vapor and temperature profiling radiometers. Good a priori data can be crucial in obtaining accuracy for meteorological applications. Author (ESA)

N84-33926# National Oceanic and Atmospheric Administration, Boulder, Colo. Wave Propagation Lab.
COMBINED GROUND-BASED AND SATELLITE REMOTE SENSING OF TEMPERATURE
E. R. Westwater and Wang Zhenhui (Nanjing Inst. of Meteorology) *In* ESA IGARSS 84. Remote Sensing: From Res. towards Operational Use, Vol. 1 Aug. 1984 p 431-436 refs (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

Results of deriving temperature and moisture from combinations of ground-based microwave and orbiting satellite (NOAA 6/7) radiometric data are presented. The accuracies of pressure heights derived from the combined data are comparable with the accuracy of pressure heights obtained from radiosondes. Some VHF radar (wavelength = 6 m) measurements of tropopause height are also used to improve temperature retrieval accuracy. Author (ESA)

N84-33927# Radio Research Labs., Tokyo (Japan).
REMOTE SENSING OF RAIN BY AN AIRBORNE DUAL-FREQUENCY MICROWAVE SCATTEROMETER/RADIOMETER
Masaharu Fujita, Kenichi Okamoto, Harunobu Masuko, Takeyuki Jima, and Nobuyoshi Fugono *In* ESA IGARSS 84. Remote Sensing: From Res. towards Operational Use, Vol. 1 Aug. 1984 p 437-441 refs (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

Airborne dual-frequency microwave scatterometer/radiometer data are analyzed to infer rain rate measured from topside. The equation of radiative transfer is used to relate rain rate profile measured by the scatterometer to antenna temperature measured by the radiometer. The influence of the ocean surface temperature is evaluated by a model computation. The effect of non uniform rain in the vertical direction on the measurements of antenna temperature is also evaluated using the experimental data. Excess antenna temperature, delta TB (difference between the antenna temperature under raining and no-rain condition) and path-integrated rain rate, R integ, are related at 10GHz band as: delta TB = 1.18 R integ. Author (ESA)

N84-33928# Radio Research Labs., Tokyo (Japan).
DIFFERENTIAL EMISSION MEASUREMENT FOR ATMOSPHERIC ABSORPTION BY A GROUND-BASED MICROWAVE RADIOMETER
T. Ojima *In* ESA IGARSS 84. Remote Sensing: From Res.

towards Operational Use, Vol. 1 Aug. 1984 p 443-448 refs (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

Differential emission measurements (DEM) by successively observing sky temperature at two different elevation angles of an antenna were made for 8 months by a ground-based dual-frequency microwave radiometer at 20.3 and 31.4 GHz. Frequencies were chosen to retrieve atmospheric water vapor excess path-length without cloudy effects. The water vapor excess path-length is found to highly correlate with integrated water-vapor content. The integrated water-vapor content was also derived from measured atmospheric absorption together with integrated liquid-water content in clouds. In these conversions atmospheric absorption is a key parameter. Author (ESA)

N84-33929*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Earth and Space Sciences Div.
RETRIEVAL OF VERTICAL MOISTURE PROFILES WITH MICROWAVE RADIOMETRY
Ramesh K. Kakar and Bjorn H. Lambrigtsen (Institute for Atmospheric Optics and Remote Sensing) *In* ESA IGARSS 84. Remote Sensing: From Res. towards Operational Use, Vol. 1 Aug. 1984 p 449-451 refs Sponsored by NASA (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01 CSCL 05B

A statistical correlation technique is applied to the retrieval of vertical moisture profiles from downlooking radiometric measurements of atmospheric radiation at microwave wavelengths. Only an optimum subset of available radiometer channels is selected for estimating water vapor at specific pressure levels. To test its validity the algorithm was applied, in a numerical experiment, to 50 independent tropical radiosondes over a sea surface. It was also used to retrieve continuous sequences of atmospheric moisture profiles from a set of data obtained with a 4-channel microwave radiometer carried aboard an aircraft over a land surface. Author (ESA)

N84-33930# Arizona Univ., Tucson.
RECOVERY OF SPECTRAL OPTICAL DEPTH AND ZERO-AIRMASS SOLAR SPECTRAL IRRADIANCE UNDER CONDITIONS OF TEMPORALLY VARYING OPTICAL DEPTH
J. A. Reagan, I. C. Scott-Fleming, B. M. Herman, and R. M. Schotland *In* ESA IGARSS 84. Remote Sensing: From Res. towards Operational Use, Vol. 1 Aug. 1984 p 455-459 refs (For primary document see N84-33857 23-43)
(Grants NA80RAD00065; NSF ATM-80-12908)
Avail: NTIS HC A24/MF A01

The effect of temporal variations in atmospheric optical depth on the determination of the zero-airmass voltage via Langley plot fitting of solar radiometer data is analyzed. It is shown that short-term variations in optical depth can be detected fairly accurately with only an approximate estimate of the zero-airmass voltage. Simulations to assess the effect of specific time variations in optical depth on zero-airmass voltage determinations are presented. It is shown that the fractional error in the zero-airmass voltage determination varies in an approximately one to one relation to the absolute change in optical depth. It is also shown that the error in the zero-airmass voltage determination can be much greater (10 to 100 times greater) than the standard deviation of this voltage obtained from the least-squares straight-line fit of the Langley plot data. Author (ESA)

N84-33931# Valencia Univ. (Spain). Dept. of Thermology.
USE OF SATELLITES IN FROST FORECASTING: SIPHES
V. Caselles, V. Gandia, and J. Melia *In* ESA IGARSS 84. Remote Sensing: From Res. towards Operational Use, Vol. 1 Aug. 1984 p 461-465 refs Original contains color illustrations (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

A radiation frost system of nowcasting was developed for an agricultural area using apparent temperature images supplied by Heat Capacity Mapping Mission and temperature values of the air at 1.5 m above ground, obtained from meteorological shelters distributed over the area of study. The method predicts, with an anticipation of 8 hr, the minimum temperature values in nights of strong radiation and mild winds, to an accuracy of + or - 1.5 K. Author (ESA)

N84-33932# National Oceanic and Atmospheric Administration, Boulder, Colo.
SIMULTANEOUS REMOTE SENSING OF ATMOSPHERIC TURBULENCE BY RADAR OPTICAL MEANS: A COMPARISON
John L. Green and Jean Vernin (Nice Univ.) *In* ESA IGARSS 84. Remote Sensing: From Res. towards Operational Use, Vol. 1 Aug. 1984 p 467-472 refs (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

Height profiles of the magnitude of the refractivity structure constant were measured simultaneously by an optical double star scintillometer and a VHF ST radar. The measured profiles were also compared to a statistical model of turbulence using data from rawinsonde ascents. In the stratosphere the scintillometer, radar and turbulence model always agree. At the tropopause and lower altitudes, the agreement is not consistent. Author (ESA)

N84-33933# Politecnico di Torino (Italy). Dipt. di Elettronica.
A DISCRIMINANT ANALYSIS OF RADAR DATA APPLIED TO SEVERE STORMS
Flavio Canavero and Giovanni E. Perona *In* ESA IGARSS 84. Remote Sensing: From Res. towards Operational Use, Vol. 1 Aug. 1984 p 473-478 refs (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

Data from 5-cm conventional meteorological radar summer campaigns in the Western Po Valley (Italy) are analyzed. Echoes relative to intense convective cells were classified in comparison with surface reports of hailfalls. A qualitative description of the radar signature of such events is done considering mono and bidimensional histograms of the maximum reflectivity and maximum height of the radar returns. Substantial overlapping among the statistical distributions of the variables makes it hard to devise simple selection criteria. More quantitative information is gained by a bayesian discriminant analysis that allocates the sample elements to the population with higher posterior probability or such that the loss in case of misallocation is minimized. The best discriminant variables are the maximum reflectivity and the top of the radar echo, for which misallocation percentages of $< 20\%$ are computed. Author (ESA)

N84-33934# National Oceanic and Atmospheric Administration, Boulder, Colo. wave Propagation Lab.
RADAR CROSS SECTION MEASUREMENTS OF WINGTIP VORTICES
R. B. Chadwick, J. Jordan, and T. Detman *In* ESA IGARSS 84. Remote Sensing: From Res. towards Operational Use, Vol. 1 Aug. 1984 p 479-483 refs Sponsored by FAA (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

Experiments with an experimental clear-air radar near an airport were done to demonstrate that short range 10 cm radar can reliably detect and locate wing tip vortices shed by large jets. The radar was calibrated in return power and velocity so that radar cross sections and velocity widths could be calculated. Histograms of radar cross section (in terms of refractivity structure constant) and a weighted spectral width parameter are given for 44 vortex and 44 non vortex cases. The nonvortex data were taken just before the vortex-producing aircraft entered the antenna beam. The time variation of these two parameters for one particular case is presented. Arguments on the size of the return-producing portion of the vortex are outlined. The expected maximum range of a radar similar to that used in this experiment is shown. Author (ESA)

N84-33935*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Earth and Space Science Div.
EXPERIMENTAL VALIDATION OF A MILLIMETER WAVE RA-

DAR TECHNIQUE TO REMOTELY SENSE ATMOSPHERIC PRESSURE AT THE EARTH'S SURFACE
Dennis A. Flower, Gordon E. Peckham (Heriot-Watt University), and W. John Bradford (Science and Engineering Research Council, Chilton, England) *In* ESA IGARSS 84. Remote Sensing: From Res. towards Operational Use, Vol. 1 Aug. 1984 p 485-489 refs (For primary document see N84-33857 23-43)
(Contract NAS7-100)
Avail: NTIS HC A24/MF A01 CSCL 05B

Experiments with a millimeter wave radar operating on the NASA CV-990 aircraft which validate the technique for remotely sensing atmospheric pressure at the Earth's surface are described. Measurements show that the precise millimeter wave observations needed to deduce pressure from space with an accuracy of 1 mb are possible, that sea surface reflection properties agree with theory and that the measured variation of differential absorption with altitude corresponds to that expected from spectroscopic models. Author (ESA)

N84-33936# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany).
STEREO METHODS IN SATELLITE METEOROLOGY
D. Lorenz *In* ESA IGARSS 84. Remote Sensing: From Res. towards Operational Use, Vol. 1 Aug. 1984 p 491-495 refs (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

Techniques for stereoscopic imaging and stereophotogrammetric measurements of clouds from space are discussed. For Europe the DFVLR concept of a Stereo Line Scanner in a polar orbit seems to be the favorable solution. It would not only improve the cloud height measurements but also provide wind determination from a polar orbit, and improve sea surface temperature measurements. The proposed Along Track Scanning Radiometer on ERS-1 is shown to be useful for a pilot experiment without specific hardware development. Author (ESA)

N84-33937# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Hochfrequenztechnik.
COHERENT POLARIMETRIC C-BAND RADAR FOR ATMOSPHERIC RESEARCH c32
A. Schroth, P. Meischner, and H. Schuster *In* ESA IGARSS 84. Remote Sensing: From Res. towards Operational Use, Vol. 1 Aug. 1984 p 497-505 refs (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

An agile coherent polarization-diversity C-band radar was designed for research in cloud physics and radio wave propagation. Its capabilities give the opportunity to look into dynamics as well as into microphysics of clouds simultaneously with high sampling densities in space and time sufficient, for instance, for comparison with modeling work. It has up to 75m resolution, 60Km unambiguous range. Modes of operation and signal processing are summarized. Author (ESA)

N84-33938# Schlumberger-Doll Research, Ridgefield, Conn.
PROFILE INVERSION OF A PLANAR MEDIUM WITH A LINE SOURCE OR A POINT SOURCE c64
W. C. Chew and S. L. Chuan *In* ESA IGARSS 84. Remote Sensing: From Res. towards Operational Use, Vol. 1 Aug. 1984 p 509-511 refs (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

An algorithm to reconstruct the profile of the electrical properties of a slab medium is described. The reconstruction is demonstrated for lossless dielectric and lossy conductive media. The procedure used is iterative whereby a distorted Born approximation is made at each iteration. The algorithm only requires a finite number of measurements at one frequency. These can be measurements at a finite number of receivers, or reflection experiments at a finite number of incident angles. Author (ESA)

N84-33939# Schlumberger-Doll Research, Ridgefield, Conn.
DIFFRACTION OF WAVES BY BED BOUNDARIES IN AN OPEN BOREHOLE
W. C. Chew and B. Anderson *In* ESA IGARSS 84. Remote Sensing: From Res. towards Operational Use, Vol. 1 Aug. 1984 p 513-516 refs (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

The diffraction of fields and waves by an open geometry which has mixture of vertical and horizontal boundaries is solved with a semianalytic approach. The axial-symmetric cases with both TE and TM polarizations are presented. The method is 100 to 200 times faster than the finite element method. The approach is to divide a composite boundary value problem into regions. The eigenfunctions in each region are sought numerically, and the total solution to the problem is obtained by matching boundary conditions at the boundary. Author (ESA)

N84-33940# Schlumberger Well Surveying Corp., Houston, Tex.
RADIAL INVERSION OF TE MEASUREMENTS IN A BOREHOLE c32
Gerald N. Minerbo *In* ESA IGARSS 84. Remote Sensing: From Res. towards Operational Use, Vol. 1 Aug. 1984 p 517-529 refs (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

An inversion procedure for estimating the radial profile of the electrical properties of a cylindrically symmetric medium from measurements of the transfer impedance between magnetic point dipole coils placed on the axis of symmetry at different separations is described. The inversion procedure requires matching the measured data to a modal series with a few parameters. Exact formulas for computing a radial profile corresponding to a given set of modal parameters are given. Author (ESA)

N84-33941# Arizona Univ., Tucson. Electromagnetics Lab.
TRANSIENT RESPONSE FROM THIN DYKE IN THE EARTH FOR LOOP EXCITATION c32
Allen Q. Howard *In* ESA IGARSS 84. Remote Sensing: From Res. towards Operational Use, Vol. 1 Aug. 1984 p 531-536 refs (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

An analytical method to predict the impulse response of a thin sheet anomaly in the Earth is presented. It accounts for three dimensional source configuration and lossy background. The transmitter is a circular loop of wire. A step function of current is injected into the wire. The quasi-static time domain solution has an analytical form which is a time integral of moving images. This image representation is an extension of Maxwell's original moving image solution for planar conductors in a vacuum. The analytical solution has application to geophysical prospecting since the moving image can be used as a basis for interpretation of time domain data associated with ore dyke anomalies. Transient numerical results are seen to be diagnostic of dyke conductivity thickness product, and range. Author (ESA)

N84-33942# Duisburg Univ. (West Germany). Dept. of Electrical Engineering.
A METHOD FOR THE OPTIMIZATION OF THE GEOMETRY AND THE MAGNETIZATION OF MAGNETIZED BODIES THAT ARE ASSUMED FOR THE SOLUTION OF THE INVERSE MAGNETIC FIELD PROBLEM c46
Adalbert Beyer *In* ESA IGARSS 84. Remote Sensing: From Res. towards Operational Use, Vol. 1 Aug. 1984 p 537-541 refs (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

A method for the solution of the direct magnetic field problem was used to achieve a highly efficient solution of the inverse magnetic field problem. This method includes the possibility to find a solution of the direct magnetic field problem for homogeneously as well as inhomogeneously magnetized bodies. The magnetized bodies assumed for the solution of the inverse field problem were optimized with the mean square of the error. Using this optimization method, the magnetization and/or the geometry were determined. Numerical examples show the feasibility of the method. Author (ESA)

N84-33943# Bonn Univ. (West Germany). Inst. Fuer Theoretishce Geodaesie.
GEOPHYSICAL USE OF THE DATA OF THE ERS-1 ALTIMETER
K. R. Koch *In* ESA IGARSS 84. Remote Sensing: From Res. towards Operational Use, Vol. 1 Aug. 1984 p 545-547 refs (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

The use of orbit computations to transform ERS-1 altimetric data to surface heights of the oceans and of the ice of the polar regions referred to a known reference surface, approximating mean sea level is proposed. For oceanography and geophysics the sea surface heights need to be seperated into heights of the geoid and sea surface heights referred to the geoid, which can be accomplished by frequency analysis and filtering. The accuracy of the geoid thus determined depends on the accuracy of the orbit computation of ERS-1. But even if this accuracy is inferior to the accuracy of the altimetric measurements, the determination of the sea surface heights with respect to the geoid is feasible in local ocean areas because of the repetitivity of the ground tracks of ERS-1. Author (ESA)

N84-33944# Institut Francais du Petrole, Rueil-Malmaison.
MODELING OF ELASTIC WAVE PROPAGATION BY FINITE DIFFERENCE AND FINITE ELEMENT METHODS c46
O. Gosselin, J. L. Teron, and L. Nicoletis *In* ESA IGARSS 84. Remote Sensing: From Res. towards Operational Use, Vol. 1 Aug. 1984 p 549-552 refs Prepared in cooperation with Societe Nationale Elf Aquitaine, Pau, France (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

Problems related to the finite difference and finite element solutions of the elastic (or acoustic) wave-equation are discussed, and the advantage of these methods for the simulation of realistic models in oil exploration are illustrated. The stability problems are solved by using (explicit) variational schemes. The Fourier analysis of the schemes is used to calculate the numerical errors which appear during the propagation of the numerical waves or during their reflection and transmission at a plane interface. The results show that the finite element scheme is more efficient than the finite difference schemes for models with a widely varying Poisson ratio. Examples of snapshots and synthetic seismograms are considered. Author (ESA)

N84-33945# Manitoba Univ., Winnipeg. Dept. of Earth Sciences.
ON THE HYDRODYNAMIC CORRECTIONS OF SEASAT-ALT DATA AND GEODYNAMIC APPLICATION
W. Moon and R. Lang *in* ESA IGARSS 84. Remote Sensing: From Res. towards Operational Use, Vol. 1 Aug. 1984 p 553-557 refs (For primary document see N84-33857 23-43)
(Grant NRC-A-7400)
Avail: NTIS HC A24/MF A01

An interactive hydrodynamic modelling scheme to study the transient sea surface height variations over the Hudson Bay area of Canada is investigated. Deriving estimates of meteorological forces over sea surface from limited atmospheric information are discussed. An input subroutine of a finite difference type algorithm is developed for surface wind fields. Ocean bottom friction mechanisms (linear and quadratic) are reviewed in regard to the algorithms. By combining the wind speed prediction algorithm with the interactive hydrodynamic modelling scheme, the transient sea surface corrections due to the atmospheric disturbances can be made. Results indicate that the wind speed predicted by the MSL pressure charts appears to be smaller than the SEASAT-GDR file inferred values. Author (ESA)

N84-33946*# European Space Agency, Paris (France).
THE INTERNATIONAL GEOSCIENCE AND REMOTE SENSING SYMPOSIUM (IGARSS) 84. REMOTE SENSING: FROM RESEARCH TOWARDS OPERATIONAL USE, VOLUME 2
T. D. Guyenne, ed. and J. J. Hunt, ed. Aug. 1984 328 p refs Partly in ENGLISH and FRENCH Symp. held at Strasbourg, 27-30 Aug. 1984; sponsored by NASA, IEEE Geoscience and Remote Sensing Society, Council of Europe, CNES, DFVLR, EARSeL and ESA Original contains color illustrations 2 Vol.
(NASA-CR-173978; NAS 1.26:173978; ESA-SP-215-Vol-2; ISSN-0379-6566) Avail: NTIS HC A15/MF A01; ESA, Paris $34 CSCL 08B

Synthetic aperature radar; systems components; data collection; data evaluation; optical sensor data; air pollution; water pollution; land and sea observation; active sensors (ir and w); and ers-1 are discussed. For individual titles, see N84-33947 through N84-33997.

N84-33947*# Environmental Research Inst. of Michigan, Ann Arbor. Radar Div.
ANALYSIS OF BISTATIC SAR SIGNATURES c32
E. S. Kasischke, R. W. Larson, P. L. Jackson, and B. A. Burns *In* ESA IGARSS 84: Remote Sensing: From Res. towards Operational Use, Vol. 2 Aug. 1984 p 561-567 refs Sponsored by Internal Research and Development Funds (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 17I

Bistatic SAR imagery was collected over urban and rural areas using a range of bistatic angles. The expected signatures of various targets within these areas under bistatic and monostatic imaging geometry are discussed in terms of basic imaging concepts. An analysis of the SAR imagery collected gererally supports these expectations. Observed differences result primarily from surfaces having row structure and surfaces oriented so as to produce a specular return when imaged either monostatically or bistatically, but not both. Author (ESA)

N84-33948*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DIGITAL FILTER PROCESSOR DESIGN FOR SPACEBORNE SCATTEROMETERS c35
D. Long, C. Chi, and F. Li *In* ESA IGARSS 84. Remote Sensing: From Res. towards Operational Use, Vol. 2 Aug. 1984 p 569-572 refs Sponsored by NASA (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 14B

The derivation of the Kp performance parameter for a spaceborne scatterometer using a digital processor, and tradeoff issues for a digital processor are discussed. The baseline design of a digital signal processor for the NSCAT instrument which is based on performance tradeoffs in windowing, time-overlapped processing, multiple processing channels, computational load, and the Kp performance is considered. Author (ESA)

N84-33949*# National Space Development Agency, Tokyo (Japan).
AN R AND D MODEL OF A SYNTHETIC APERTURE RADAR ANTENNA c32
N. Imura (Mitsubishi Electric Corp., Hyogo, Japan), A. Akaishi (Mitsubishi Electric Corp., Hyogo, Japan), M. Ono (Mitsubishi Electric Corp., Hyogo, Japan), Y. Hisada, and Y. Itoh *In* ESA IGARSS 84: Remote Sensing: From Res. towards Operational Use, Vol. 2 Aug. 1984 p 573-578 refs (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 17I

The test results of an R and D model of Synthetic Aperture Radar Antenna (SARA) for ERS-1 (Japanese Earth Resources Satellite-1) are summarized. Critical structural and mechanical components test, electricai performance test, deployment test and thermal deformation tests were performed and an environmental tests model was developed. The deployment test, thermal deformation test and 128 element tests (one of the electrical tests) indicate that the model meets expectations. Author (ESA)

N84-33950*# INTERA Environmental Consultants Ltd., Ottawa (Ontario).
OPTIMIZING IMAGE QUALITY FOR SAR c32
R. T. Lowry, G. W. Wessells, and D. R. Inkster *In* ESA IGARSS 84: Remote Sensing: From Res. towards Operational Use, Vol. 2

Aug. 1984 p 579-593 refs (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 17I

Image quality criteria for the design of a terrain mapping SAR are discussed. Basic resolution, degree of incoherent averaging and numbers of loits in the image are examined theoretically and with data collected over sea ice with the CCRS/ERIM SAR-580 system. The design of the INTERA STAR-1 radar along with suitable imagery, is used to demonstrate design principles. Author (ESA)

N84-33951*# Marconi Co. Ltd., Chelmsford (England).
MEASUREMENT OF GEOMETRIC DISTORTION IN AIRBORNE SAR IMAGES c32
S. Quegan *In* ESA IGARSS 84: Remote Sensing: From Res. towards Operational Use, Vol. 2 Aug. 1984 p 595-599 refs Sponsored by ESRIN, Frascati, Italy (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 17I

A technique for detecting and quantifying geometric distortions due to uncorrected platform motions in airborne SAR imagery was developed. Global measures of distortions and methods of detecting and quantifying azimuth dependent distortion are presented. The sensitivity of the technique to small random errrors in target location is simulated. The results of an experiment to quantify operator error in target location are presented. Application of the tehcnique to simultaneously recorded SAR-580 data indicated marked differences between X and L band geometric quality. Author (ESA)

N84-33952*# Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.
ESTIMATION OF ALBEDO AND OPTICAL THICKNESS WITH THE RADIATIVE TRANSFER METHOD
A. K. Fung and H. J. Eom *In* ESA IGARSS 84: Remote Sensing: From Res. towards Operational Use, Vol. 2 Aug. 1984 p 601-603 refs (For primary document see N84-33946 23-43)
(Grant NAG5-268)
Avail: NTIS HC A15/MF A01 CSCL 20F

In passive, remote sensing, it is shown that the same set of measured data may be matched by the zeroth-order and the first-order solutions of the radiative transfer equation if albedo (w) can be selected arbitrarily. This means that substantial error may exist in the estimate of the albedo when approximate solutions are used without regard to their ranges of validity. The regions of validity of the zeroth and first-order solutions are determined in terms of w and optical thickness. It is found that the region of validity of the first-order solution is substantially wider than the zeroth-order. For vegetated media where albedo is usually less than 0.3 (at C-band or lower frequencies) but larger than 0.05, the first-order solution must be used. Author (ESA)

N84-33953*# Technische Univ., Berlin (West Germany). Inst. fuer Luft- und Raumfahrt.
COMPACT RECEIVERS FOR SHUTTLE IMAGING RADAR (SIR)-B SAR MISSION c32
A. Gnaedig, W. Schaeffer, Ph. Hartl (Stuttgart Univ.), K. Chowdhu (Stuttgart Univ.), B. Seshu (DFVLR, Oberpfaffenhofen, West Germany), and A. Sieber *In* ESA IGARSS 84: Remote Sensing: From Res. towards Operational Use, Vol. 2 Aug. 1984 p 607-610 ref (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 17I

Shuttle Imaging Radar (SIR) applications, receiver concept, and data collection system are presented. Design constraints are considered and performance characteristics of the hardware are discussed. Compact receivers were developed to make mission monitoring easier for the field tests. Image processing is easier when the antenna pattern of the SAR is measured during the overflight. Determination of signal penetration through vegetation canopy can be done by applying such receivers, and it is possible to determine the soil penetration of the SAR-signals by burying receivers and measuring the field strength as a function of depth in areas of very dry soil. Author (ESA)

N84-33954*# Environmental Research Inst. of Michigan, Ann Arbor. Radar Div.
DIGITAL PROCESSING AND ABSOLUTE CALIBRATION OF A STRIPMAP SYNTHETIC APERTURE RADAR c32
P. L. Jackson, R. W. Larson, A. Dias, and D. B. Franczak *In* ESA IGARSS 84: Remote Sensing: From Res. towards Operational Use, Vol. 2 Aug. 1984 p 611-614 refs (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 17I

A digital stripmap processor was developed for the ERIM-CCRS X-C-L SAR that can be used with any airborne stripmap SAR. The processor can accommodate a wide variation of flight parameters, can be readily adjusted to refine focusing, resolution, and sidelobe characteristics, and provides the framework for a satellite SAR processor. The processor also accommodates a SAR calibration algorithm. Absolute calibration of SAR images is achieved using a special signal generator, reference reflectors, and the digital processor. Synthetic phase histories are generated and injected into the radar system and processed as if they were real data. The processed synthetic signals are compared to imaged calibration reflections, providing absolute reference values for subsequent SAR imaging flights. The conventional offline digital processor is configured for ease in comparing the calibration level with image levels throughout the SAR image. Author (ESA)

N84-33955*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Tracking Systems and Applications Section.
CALIBRATION OF PRECISE SATELLITE ALTIMETRY FOR THE IONOSPHERE AND WET TROPOSPHERE c35
J. R. Benada and P. S. Callahan *In* ESA IGARSS 84: Remote Sensing: From Res. towards Operational Use, Vol. 2 Aug. 1984 p 615-618 refs (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 14B

Ionospheric variability; dual frequency altimeter measurement of ionospheric error; and determination of wet tropospheric error from a three frequency microwave radiometer are discussed. Temporal and/or spatial extrapolations of the ionosphere are likely to result in errors of 20% to 30% of the total ionospheric effect which is 2 to 20 cm at 13.7 GHz. The TOPEX dual frequency system can measure the effect to 1.3 cm. The TOPEX 3 frequency microwave radiometer can meet the TOPEX requirement of a 1.2 cm wet troposphere calibration, if the correction algorithm is calibrated with data from a variety of humid conditions.
Author (ESA)

N84-33956*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SASS 1 MODEL FUNCTION EVALUATION AND UPGRADE c35
C. L. Britt (Research Triangle Inst., Research Triangle Park, N.C.) and L. C. Schroeder *In* ESA IGARSS 84: Remote Sensing: From Res. towards Operational Use, Vol. 2 Aug. 1984 p 623-629 refs (For primary document see N84-33946 23-43)
(Contract NAS1-15338)
Avail: NTIS HC A15/MF A01 CSCL 14B

A large data base of Seasat A Satellite Scatterometer (SASS) measurements merged with high-quality surface truth wind data was developed by determining the times when SASS measurements were taken in the vicinity of selected in situ measurement sites. Good data obtained from 37 sites located in the coastal waters of North America, Australia, Western Europe and Japan were assembled by correlating the SASS and surface truth measurements in time and space. These data were analyzed to independently determine the model function suggested for inversion of SASS data to winds. Wind inversion errors of the model function are examined and compared with errors from the SASS 1 model function. Author (ESA)

N84-33957*# Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.
THE EFFECT OF WAVELENGTH FILTERING IN ROUGH SURFACE SCATTERING c32
A. K. Fung and M. F. Chen *In* ESA IGARSS 84: Remote

Sensing: From Res. towards Operational Use, Vol. 2 Aug. 1984 p 631-637 refs (For primary document see N84-33946 23-43) (Grant NSF ECS-83-02087)
Avail: NTIS HC A15/MF A01 CSCL 20N

Numerical simulation studies were carried out to examine the effect of filtering by the incident wavelength on the different roughness states of one-dimensional perfectly conducting random surfaces. Two Gaussian distributed and correlated random surfaces with different rms slopes are generated. The backscattering coefficients under different frequencies for these simple surfaces are examined. Two types of composite random surfaces are generated: one type is the superposition of a small scale roughness with a large scale roughness of different correlation lengths, and the other is the superposition of two scales of roughnesses that are a factor of two apart in correlation length. Only one incident wavelength is used to compute scattering from type one and several wavelengths are applied to type two. Results show that frequency filtering is applicable at low to medium-high frequencies, but not above. Author (ESA)

N84-33958*# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany).
SIMULATION OF SHUTTLE IMAGING RADAR (SIR)-B IMAGERY OVER FREIBURG TEST SITE **c32**
A. J. Sieber, A. Popella, and Ph. Hartl (Stuttgart Univ.) *In* ESA IGARSS 84: Remote Sensing: From Res. towards Operational Use, Vol. 2 Aug. 1984 p 639-642 refs (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 17I

The Shuttle Imaging Radar image simulator is described. The simulator consists of two programs. The first is an interactive program which checks imput data validity. The second performs the image simulation. The first step is the computation of the received power as a function of the geometry and the backscatter behavior of the target. The simulation of the speckle and the system effects is done within a second step. The last step is the generation of a displayable image (8 bit). The input program creates a file which contains all the necessary data. This file is taken by the simulation program. Therefore it does not need any further data and performs the time intensive simulation entirely automatically. Inputs are a digital terrain model and a reflectivity ground truth file. Author (ESA)

N84-33959*# Graz Univ. (Austria). Research Center.
EVALUATION OF RADAR STEREO VIEWABILITY BY MEANS OF A SIMULATION TECHNIQUE
G. Domik *In* ESA IGARSS 84: Remote Sensing: From Res. towards Operational Use, Vol. 2 Aug. 1984 p 643-646 refs (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 17I

A system for simulating radar images was developed. Variable parameters are sensor configuration, imaging parameters and backscatter curves to assign gray values to the image coordinates. Same side flight/different look angles; distortions in same side stereo by applied squint angle; and crossing flight path/same look angle were investigated. Author (ESA)

N84-33960*# Arkansas Univ., Fayetteville. Dept. of Electrical Engineering.
DIGITAL COLOR SPACE TRANSFORMATIONS **c61**
R. W. Jing, V. H. Kaupp, W. P. Waite, and H. C. MacDonald *In* ESA IGARSS 84: Remote Sensing: From Res. towards Operational Use, Vol. 2 Aug. 1984 p 649-654 refs (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 09B

The mapping and geometric relationships of the intensity, hue and saturation and red, green and blue (RGB) coordinate systems used for color space description are examined, and an algorithm for performing the spatial variant transformation from one system to the other is described. The algorithm produces the expected results for the entire surface of the cube in color coordinate space that corresponds to that portion of the space which is displayable on RGB display devices. A representative series of points within the volume of the cube was examined. Results are satisfactory. Author (ESA)

N84-33961*# Milan Univ. (Italy). Dept. of Physics.
INTERACTIVE AUTOMATIC SYSTEM (IASP): AN EXPERT SYSTEM TO HELP PHOTOINTERPRETATION **c61**
V. DeRos, P. Mussio, and G. M. Lechi (CNR, Milan) *In* ESA IGARSS 84: Remote Sensing: From Res. towards Operational Use, Vol. 2 Aug. 1984 p 655-660 refs (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 09B

A procedure for the location and classification of trees of given species in a real scene by interactive analysis of their tracks in digitized images, is presented. The approach followed in the implementation of the interactive tools is described. Results of the tuning and test of the instrument are discussed. Author (ESA)

N84-33962*# Science Applications Research, Riverdale, Md.
MULTIRESOLUTION SPATIALLY CONSTRAINED CLUSTERING OF REMOTELY SENSED DATA ON THE MASSIVELY PARALLEL PROCESSOR **c61**
J. C. Tilton *In* ESA IGARSS 84: Remote Sensing: From Res. towards Operational Use, Vol. 2 Aug. 1984 p 661-666 refs (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 09B

A multiresolution spatially-constrained clustering (MSCC) algorithm implemented on the Massively Parallel Processor is discussed. The MSCC algorithm uses a coarse-to-fine resolution schema and region switching and region splitting algorithms. Applications include production of segments of remotely sensed imagery and as front and for a classification of a cluster compression algorithm. Author (ESA)

N84-33963*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ANALYSING REMOTELY SENSED DATA ON THE MASSIVELY PARALLEL PROCESSOR **c61**
James C. Tilton (Science Applications Research, Riverdale, Maryland) and James P. Strong *In* ESA IGARSS 84: Remote Sensing: From Res. towards Operational Use, Vol. 2 Aug. 1984 p 667-672 refs (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 09B

Massively Parallel Processor (MPP) implementation of the ISODATA, and Maximum Likelihood classification algorithms for remotely sensed data is described. Implementation on the MPP of a Spatially Constrained Clustering scheme and a Contextual Classifier is outlined. Author (ESA)

N84-33964*# Florence Univ. (Italy). Dipt. di Ingegneria Elettronica.
APPLICATION OF THE DISCRETE COSINE TRANSFORM TO REMOTE SENSING IMAGE DATA COMPRESSION **c61**
E. DelRe *In* ESA IGARSS 84: Remote Sensing: From Res. towards Operational Use, Vol. 2 Aug. 1984 p 673-676 refs (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 09B

A fast algorithm for implementation of the discrete cosine transform (DCT) to remote sensing image data compression is presented. Zonal and threshold sampling methods are evaluated. The DCT and the Fast Fourier Transform are compared. Quantitative and qualitative results are presented for evaluating the various alternatives for DCT application. Results show that a convenient choice is the threshold sampling method applied to transformed blocks of size ranging from 8 x 8 to 32 x 32. Author (ESA)

N84-33965*# GKSS-Forschungszentrum Geesthacht (West Germany).
HYDROGEN CHLORIDE MEASUREMENTS WITH A DIFFERENTIAL ABSORPTION AND SCATTERING (DAS) LIDAR IN THE MARINE ATMOSPHERE [INST. FUER PHYSIK.] **c45**
H.-J. Heinrich, C. Weitkamp, and W. Michaelis *In* ESA AGARSS 84: Remote Sensing: From Res. towards Operational Use, Vol. 2 Aug. 1984 p 679-684 refs (For primary document see

N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 13B

A differential absorption and scattering lidar that measures hydrogen chloride with a sensitivity of 300 parts per billion and a range of 2 km is described. The P2(3) and P2(5) lines around 3.6 microns from a deuterium fluoride laser are used as the signal and reference line, respectivley. The system was used for investigations of the diffusion and degradation behavior of HCl from at-sea incineration of organochlorine waste in the marine atmosphere. Author (ESA)

N84-33966*# GKSS-Forschungszentrum Geesthacht (West Germany). Inst fuer Physik.
STATE-OF-THE ART DIFFERENTIAL ABSORPTION AND SCATTERING (DAS) LIDAR FOR SO2 AND NO2 c45
W Lahmann, W. Staehr, C. Weitkamp, and W. Michaelis *In* ESA IGARSS 84: Remote Sensing: From Res. towards Operational Use, Vol. 2 Aug. 1984 p 685-688 refs (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 13B

A ground-based laser remote sensing system for the range-resolved detection of sulfur dioxide and nitrogen dioxide is described. The measurement is based on the differential absorption and scattering lidar technique. Both lasers are fired with a fixed time delay of 50 microsec to probe an atmosphere with unchanged optical properties. The NO2 is detected with two dye lasers emitting arouns 450 nm; SO2 is measured at 300 nm with the frequency-doubled output of two dye lasers. Field measurements in a city are presented. Determinations of SO2 emission rates from a smokestack agree well with operator data.
Author (ESA)

N84-33967*# Deutscher Wetterdienst, Hamburg (West Germany).
LIDAR OBSERVATIONS OF THE PLUMES OF INCINERATION SHIPS c45
K. Klapheck *In* ESA IGARSS 84: Remote Sensing: From Res. towards Operational Use, Vol. 2 Aug. 1984 p 689-693 refs (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 13B

Operations of a lidar system on board a ship in the incineration area of the North Sea are summarized. The plumes of incineration ships were observed, to study propagation processes in the boundary layer above the sea surface. Examples of lidar soundings are presented. Author (ESA)

N84-33968*# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. of Atmospheric Physics.
QUANTITATIVE DETERMINATION OF AEROSOL CONCENTRATIONS BY LIDAR WITH RESPECT TO VARIOUS RELATIVE HUMIDITIES c46
D. Paffrath and E. Kirchschlager *In* ESA IGARSS 84: Remote Sensing: From Res. towards Operational Use, Vol. 2 Aug. 1984 p 695-698 refs (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 04A

A lidar system for the remote measurement of aerosol mass concentrations was tested during an aerosol experiment in a valley near a large town. It is demonstrated that it is possible to obtain vertical and horizontal distributions of the scattering coefficient, but this is not always a suitable measure of air pollution particularly in the case of high relative humidities. In order to take this influence into account an experimentally obtained correction function is presented. Author (ESA)

N84-33969*# Joint Research Centre of the European Communities, Ispra (Italy).
REMOTE MONITORING OF SEDIMENTS AND CHLOROPHYLL AS TRACES OF POLLUTANT MOVEMENTS IN A MEDITERRANEAN COASTAL AREA c45
G. M. Ferrari, S. R. GallideParatesi, G. Maracci, M. Ooms, P. B. Schlittenahrdt, and S. Tassan *In* ESA IGARSS 84: Remote Sensing: From Res. towards Operational Use, Vol. 2 Aug. 1984 p 701-707 refs (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF CSCL 13B

A research plan to clarify whether aerospace remotely sensed data could complement and present advantages over conventional technical data for contributing to the defense of the sea and marine coastal life is introduced. The project is intended to confirm the validity of Coastal Zone Color Scanner (CZCS) algorithms for turbid (water 2-type) coastal zones; to establish correlation functions between CZCS data and transported chemical pollutants; and to calibrate, complete, and improve the numerical circulation model for the Northern Adriatic Basin. The feasibility of surveillance by remote sensing of propagation of anthropogenic pollutants in estuaries and coastal zones is reported. Author (ESA)

N84-33970*# GKSS-Forschungszentrum Geesthacht (West Germany).
THE INFLUENCE OF PERTURBING WATER PROPERTIES IN CHLOROPHYLL MAPPING
J. Fischer (Technische Univ., Munich) and P. Koepke *In* ESA IGARSS 84: Remote Sensing: From Res. Towards Operational Use, Vol. 2 Aug. 1984 p 709-713 refs (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 06C

The influence of water content and surface roughness on chlorophyll mapping in coastal water and the open ocean is discussed. Radiation fields are shown at Coastal Zone Color Scanner wavelengths. Coastal waters usually contain a mixture of suspended matter, yellow substances, and phytoplankton. The surface is rough and may have whitecaps, depending on wind speed. All these parameters contribute to the upward radiance above the ocean surface ans so have to be taken into account in adequate chlorophyll remote sensing methods. Simple relations between radiances and phytoplankton concentration have to be changed for different substance compositions. For the evaluation of chlorophyll in open ocean waters from satellite measurements, the commonly used bio-optical algorithms are quite sucessful. However, an improvement is likely, if the influence of whitecaps on the reflected radiation as well as the angle dependency of the underlight with 1/cos 0 sub sat are taken into consideration.
Author (ESA)

N84-33971*# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Wesseling (West Germany).
THE MODIFICATION OF THE MODULATION TRANSFER FUNCTION BY SEA SLICKS MEASURED BY L-BAND RADAR c45
H. Huehnerfuss (Institut fuer Organische Chemie, Hamburg), P. Lange (Bundesanstalt fuer Wasserbau, Hamburg), F. Schlude, and W. D. Garrett (NRL, Washington, D.C.) *In* ESA IGARSS 84: Remote Sensing: From Res. towards Operational Use, Vol. 2 Aug. 1984 p 715-719 refs Sponsored by Deutshce Forschungsgemeinschaft and Navy (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 13B

Tower-based L-band radar measurements performed on the North Sea covered with an experimental monomolecular oleyl alcohol sea slick revealed that the peak frequency of L-band radar cross section spectra from a 'clean' sea area (f subclean = 0.16 Hz; water wave length L = 61 m) is shifted to higher frequencies in the presence of the slick (f subslick = 0.22 Hz; L = 32 m). This effect is explained by a modification of the modulation transfer function by the monomolecular surface film. Independent wind-wave tunnel experiments performed with a wave follower mounted surface potential ionization probe support this interpretation.
Author (ESA)

N84-33972*# University of Petroleum and Minerals, Dhahran (Saudi Arabia).
DETECTION AND MONITORING OF THE 1983 NOWRUZ OIL SPILL USING AVHRR DATA c45
Marwan J. Muasher and Fuat Ince *In* ESA IGARSS 84 Remote Sensing: From Res. Towards Operational Use, Vol. 2 Aug. 1984 p 721-728 refs (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 13B

Analysis of NOAA AVHRR images of oil pollution in the Persian Gulf following major damage to two wells is described. Pollution mapping is difficult due to the impossibility of approaching the wells, poor AVHRR resolution, radiometric differences in oil and water, and slick sizes observable outside the war zone. The spill amount was such that individual slicks observable in Saudi waters did not often approach a sizable fraction (quarter or half) of a pixel, which varied between 1.2 sq km at best to 16 sq km at worst. For the specific conditions of the Nowruz spill, especially the absence of any other source of data, AVHRR data are found to be useful, but not nearly sufficient in themself, for detection and monitoring of the oil spill. Author (ESA)

N84-33973*# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Wesseling (West Germany).
OIL SPILL DETECTION WITH DFVLR X-BAND SLAR c45
H. Nithack and F. Witte *In* ESA IGARSS 84 Remote Sensing: From Res. Towards Operational Use, Vol. 2 Aug. 1984 p 729-733 (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 13B

A SLAR working at 9.6 GHz with VV polarization operated at 1000 m above sea level was assessed for oil slick detection. The quick look images (55 scenes taken during 4 flights) show the good ability of the SLAR to detect oil slicks. After data correction (elimination of antenna pattern) oil slicks of 2 km diameter can be classified with an error < 10%. The best viewing direction is perpendicular to the waves. The detection and classification quality of oil slicks strongly depends on the sea state. Author (ESA)

N84-33974*# Conoco, Inc., Ponca City, Okla.
AN ACTIVE REMOTE SENSING SYSTEM TO MAP LOCATION OF UNDERWATER OIL SEEPS c45
A. C. Correa, A. J. Blanchard (Texas University, Arlington), and J. S. Gergely *In* ESA IGARSS 84 Remote Sensing: From Res. Towards Operational Use, Vol. 2 Aug. 1984 p 735-740 refs (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 13B

An underwater oil detection system using active remote sensing technology similar to that employed to detect oil slicks at the sea surface is proposed. The system observes the interaction between a beam of transmitted energy and the oil. Fluorescence and scattering response of oil to specific light wavelengths are measured. The system is composed of laser excitation source, fluorescence receiver, polarization receiver, ranging system, platform stabilization equipment, and data acquisition system. Selection of appropriate wavelengths for transmitted and received light, operational range of the system, scanning speed required to generate an image of the sea floor, stability and maneuverability of instrument platform, and precision and accuracy of measurements are discussed. Author (ESA)

N84-33975*# Technical Univ. of Denmark, Lyngby.
MICROWAVE RADIOMETRY FOR OIL POLLUTION MONITORING, MEASUREMENT AND SYSTEMS c45
N. Skou *In* ESA IGARSS 84 Remote Sensing: From Res. Towards Operational Use, Vol. 2 Aug. 1984 p 741-747 refs Original contains color illustrations (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 13B

A multichannel imaging radiometer system was flown in large scale oil pollution experiments. Oil thickness and volumes are underestimated by up to a factor of 2, and the measured brightness temperatures stay at low values. The problem is due to the antenna making a linear averaging over its footprint of the brightness temperature scenario and not of the thickness distribution, and the relationship between oil thickness and brightness temperature is not linear. Computer simulations of the total measurement situation also show how a given input oil thickness scenario may be underestimated by a factor of 2 to 3 without the measured brightness temperatures reaching alarming values indicating possible ambiguity problems. Underestimation of reasonably sized slicks can be solved by simultaneous inspection of the 34 GHz channel and a lower frequency channel. Author (ESA)

N84-33976*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
AIRBORNE VISIBLE/INFRARED IMAGING SPECTROMETER (AVIRIS): AN ADVANCED TOOL FOR EARTH REMOTE SENSING c35
G. Vane, M. Chrisp, H. Enmark, S. Solomon and J. Macenka *In* ESA IGARSS 84 Remote Sensing: From Res. Towards Operational Use, Vol. 2 Aug. 1984 p 751-757 refs Sponsored by NASA (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 14B

The Airborne Visible/Infrared Imaging Spectrometer (AVIRIS) second-generation remote sensing instrument is described. The AVIRIS is an opto-mechanical scanner that uses line arrays of detectors to image a 550-pixel swath in 224 contiguous spectral bands from 0.4 to 2.4 microns. The instrument will be flown aboard a U-2 aricraft. The data processing system, based on a VAX 11-780 minicomputer, provides rapid access to flight data, and analysis software is under development. Author (ESA)

N84-33977*# RCA Advanced Technology Labs., Camden, N. J.
MULTISPECTRAL LINEAR ARRAY VISIBLE AND SHORTWAVE INFRARED SENSORS c35
J. R. Tower, F. B. Warren, L. E. Pellon, R.T. Strong, H. Elabd (RCA Labs.), A. D. Cope (RCA Labs.), D. M. Hoffmann (RCA Labs.), W. M. Kramer (RCA Electro Optics Division, Lancaster, Pennsylvania), and R. W. Longsderff (RCA Electro Optics Division, Lancaster, Pennsylvania) *In* ESA IGARSS 84 Remote Sensing: From Res. Towards Operational Use, Vol. 2 Aug. 1984 p 759-764 refs (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 14B

All-solid state pushbroom sensors for multispectral linear array (MLA) instruments to replace mechanical scanners used on LANDSAT satellites are introduced. A buttable, four-spectral-band, linear-format charge coupled device (CCD) and a buttable, two-spectral-band, linear-format, shortwave infrared CCD are described. These silicon integrated circuits may be butted end to end to provide multispectral focal planes with thousands of contiguous, in-line photosites. The visible CCD integrated circuit is organized as four linear arrays of 1024 pixels each. Each array views the scene in a different spectral window, resulting in a four-band sensor. The shortwave infrared (SWIR) sensor is organized as 2 linear arrays of 512 detectors each. Each linear array is optimized for performance at a different wavelength in the SWIR band. Author (ESA)

N84-33978*# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany).
PRELIMINARY INVESTIGATIONS CONCERNING A 90 GHz RADIOMETER SATELLITE EXPERIMENT c35
F. Heel and H. Kietzmann *In* ESA IGARSS 84 Remote Sensing: From Res. Towards Operational Use, Vol. 2 Aug. 1984 p 765-769 refs (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 14B

Satellite radiometer studies of the Earth's surface, clouds and fog are discussed. Using a computer model, the radiation temperatures of sand, vegetation, concrete and water are determined for different atmospheric conditions. Measurements with an uncooled airborne 90 GHz radiometer test model results. To accomplish the planned experiments a special null balancing radiometer is proposed. In the case of null balancing failure this system also can be operated as total power radiometer. Author (ESA)

N84-33979*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
NASA SCATTEROMETER RESEARCH DATA PROCESSING SYSTEM: REQUIREMENTS AND DESIGN c35
P. S. Callahan, J. R. Benada, E. L. Noon, G. E. Leach, J. W. Brown, G. Pihos, P. J. McCabe, and D. B. Lame *In* ESA IGARSS 84 Remote Sensing: From Res. Towards Operational Use, Vol. 2 Aug. 1984 p 771-776 refs (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 14B

A data processing system for research users of the NASA

scatterometer data is introduced. A system with multiple processors and large storage capacity is needed to deal with the volume of sensor data (40 Mbytes/day) and the computationally intensive processing it requires. Dealiasing is required to select a unique wind vector from the multiple solutions obtained. Wind field maps are required to give investigators an overview of the large volumes of data. Author (ESA)

N84-33980*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
NASA SCATTEROMETER ON NROSS: A SYSTEM FOR GLOBAL OBSERVATIONS OF OCEANIC WINDS c35
F. Li, P. Callahan, M. Freilich, D. Lame, and C. Winn *In* ESA IGARSS 84 Remote Sensing: From Res. Towards Operational Use, Vol. 2 Aug. 1984 p 777-780 refs Sponsored by NASA (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 14B

A scatterometer to be flown on the Navy Remote Ocean Sensing System, to provide wind data, and an associated research mode data processing system are described. The scatterometer is heavily based on the Seasat scatterometer. Author (ESA)

N84-33981*# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
SPECTRASAT: A CONCEPT FOR THE COLLECTION OF GLOBAL DIRECTIONAL WAVE SPECTRA c32
Robert C. Beal *In* ESA IGARSS 84 Remote Sensing: From Res. towards Operational Use, Vol. 2 Aug. 1984 p 781-786 refs Sponsored in part by Navy (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 17I

Spectrasat, a low altitude satellite for SAR sensing of ocean waves is proposed. The instantaneous ground swath need be sufficient only for a statistically reliable transform, of order 10 km or less. This allows a greatly reduced (with respect to Seasat) along-track antenna dimension, (1 to 2 m). The potentially overwhelming data rate problem is consequently alleviated, not only by the reduction in swath, but also by sparse sampling of the spectra, similar to the scheme planned for the ERS-1 (ESA) in its sampled wave mode. Global sampling strategies depend mainly on the scale size of storms in the open ocean, and on whether oceanographic significance can be attached to the observed fine scale evolution of the dominant wave vector. An adaptive sampling strategy, built around an onboard buffer storage and electronically steerable antenna beams, allows increased sampling in the vicinity of developing storms. Author (ESA)

N84-33982*# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
THE NAVY GEOSAT MISSION RADAR ALTIMETER SATELLITE PROGRAM c32
C. C. Kilgus and J. L. MacArthur *In* ESA IGARSS 84 Remote Sensing: From Res. Towards Operational Use, Vol. 2 Aug. 1984 p 787-790 refs (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 14B

The Navy Geosat Mission to place a radar altimeter spacecraft in approximately the Seasat-1 orbit in the fall of 1984 is introduced. This mission will employ an altimeter with 3.5 cm precision at 2 m significant waveheight. An 800 km altitude, 108 deg inclination orbit will provide 3 day, near-repeat ground tracks. Dual-frequency Doppler tracking will allow precision orbit determination. Data will be stored for approximately 12 hr on the spacecraft for transmission to the satellite tracking facility. The ground system will preprocess data. Author (ESA)

N84-33983*# Technische Univ., Munich (West Germany).
LASER REMOTE SENSING MEASUREMENTS OF NATURAL TARGET REFLECTIVITIES c36
F. Lehamnn, W. Wiesemann (Battelle-Institut), M. Rother (Battelle Institut), and C. Werner (DFVLR) *In* ESA AIGRSS 84 Remote Sensing: From Res. Towards Operational Use, Vol. 2 Aug. 1984 p 793-796 refs Sponsored by German Federal Ministry for Research and Technology (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 20E

The application possibilities of active infrared spectroscopy to remote sensing of soil and rock types and surface soil moisture was investigated in laboratory work and flight campaigns. For the flight measurements the DIALEX instrument, a profiling laser spectrometer with tunable CO2-lasers (9 to 11 microns) was used. The differential reflection data of flight measurements agree with laboratory results. The mean deviation between these data is 15%. Especially for large homogeneous test sites like grass land, ploughed fields and lake Ammersee the mean deviation is < 15%. Author (ESA)

N84-33984*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DEMONSTRATION OF AN ACTIVE AIRBORNE IR LASER SYSTEM FOR GEOLOGIC REMOTE SENSING c36
A. B. Kahle, M. S. Shumate, and D. B. Nash *In* ESA IGARSS 84 Remote Sensing: From Res. Towards Operational Use, Vol. 2 Aug. 1984 p 797-799 refs (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 20E

Geological units in Death Valley, California were distinguished by differences in their reflectance of thermal infrared radiation emitted by dual airborne CO2 lasers tuned to 9.23 and 10.27 microns, demonstrating the feasibility of an active, laser remote sensing system. Data obtained with the lasers are highly correlated with imagery of the same area collected with the Thermal Infrared Multispectral Scanner. Author (ESA)

N84-33985*# Canada Centre for Remote Sensing, Ottawa (Ontario).
CONCEPTUAL DESIGN OF SATELLITE SAR c32
R. K. Raney *In* ESA IGARSS 84 Remote Sensing: From Res. Towards Operational Use, Vol. 2 Aug. 1984 p 801-807 refs (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 20N

A technique for the conceptual design of satellite Synthetic Aperture Radar (SAR) systems is described. The principal issues are resolution and spatial coverage. Basic geometric and coverage tradeoffs and restraints intended to facilitate constructive dialogue between applications specialists and radar systems people are presented. Examples are drawn from Seasat, ERS-1, and Radarsat. Author (ESA)

N84-33986*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE VENUS RADAR MAPPER: RADAR SYSTEM DESIGN FOR HIGHLY ELLIPTICAL ORBITS c32
William T. K. Johnson *In* ESA IGARSS 84 Remote Sensing: from Res. Towards Operational Use, Vol. 2 Aug. 1984 p 809-813 refs Sponsored by NASA (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 17I

A multimode (SAR, altimeter, radiometer) radar system was designed for the Venus Radar Mapper highly elliptical orbital geometry. The nominal mission lasts one full Venusian rotation of 243 days. The science objectives, mission constraints, radar system design, flight hardware, and ground processing methods are summarized. Author (ESA)

N84-33987*# Nippon Electric Co. Ltd., Tokyo (Japan).
A CASE STUDY OF SPACEBORNE SYNTHETIC APERTURE RADAR SYSTEM DESIGN FOR THE EARTH RESOURCES SATELLITE c32
H. Kashihara, K. Tanaka, M. Fukai, J. Komai (Earth Resources Satellite Data Analysis Center, Tokyo), and M. Sano (Earth Resources Satellite Data Analysis Center, Tokyo) *In* ESA IGARSS 84 Remote Sensing: From Res. Towards Operational Use, Vol. 2 Aug. 1984 p 815-820 refs (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 17I

A case study of a spaceborne SAR degign, including perfor-

mance parameters tradeoff between mission requirements and limitations/constraints of hardware/satellite capabilities/SAR system is described. Principal mission requirements are observation of geological features of land with the finest resolution, the highest contrast and the largest incident angle. Radar frequency, spatial resolution, swath width and incident angle vs. output power, power consumption, antenna size, weight, data rate are discussed. Feasible SAR design menus for an Earth Resources Satellite are presented. Author (ESA)

N84-33988*# Nippon Electric Co. Ltd., Tokyo (Japan).
SOME TEST RESULTS OF SYNTHETIC APERTURE RADAR TRANSMITTER AND RECEIVER **c32**
M. Fukai, K. Tanaka, H. Kashihara, L. Izumi, E. Kadota, E. Takano, Y. Itoh (National Space Development Agency, Ibaraki, Japan), and Y. Hisada (National Space Development Agency, Ibaraki, Japan) *In* ESA IGARSS 84 Remote Sensing: From Res. Towards Operational Use, Vol. 2 Aug. 1984 p 821-825 ref (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 17I

Tests of a SAR suitable for the Japanese Earth Resources Satellite 1 are summarized. Around 600 W of output power is obtained from one solid state amplifier. Four times 10 to the minus 10 th power rms/sec frequency stability in a short time period was obtained by an oven-controlled crystal oscillator. The electrical design technique of the high TBP chirp modulator using a surface acoustic wave dispersive delay line is established. Author (ESA)

N84-33989*# Marconi Space and Defence Systems Ltd., Portsmouth (England)
ERS SYNTHETIC APERTURE RADAR DESIGN **c32**
F. G. Sawyer, R. P. Cox, and H. Joyce *In* ESA IGARSS 84 Remote Sensing: From Res. Towards Operational Use, Vol. 2 Aug. 1984 p 287-832 refs (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 17I

The design processes whereby the engineering requirements of the ERS-1 SAR are derived, and the technological limitations to future SAR mission are discussed. The influence of spatial resolution, radiometric resolution, ambiguous response, power requirements, localisation, and data rates on the design process is considered. Author (ESA)

N84-33990*# Marconi Space and Defence Systems Ltd., Portsmouth (England)
THE ACTIVE MICROWAVE INSTRUMENT FOR ERS-1 **c35**
H. Joyce, R. P. Cox, and F. G. Sawyer *In* ESA IGARSS 84 Remote Sensing: From Res. Towards Operational Use, Vol. 2 Aug. 1984 p 835-840 refs (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 14B

The Active Microwave Instrumentation for the ERS-1 remote sensing mission consists of an imaging SAR, with a spatial resolution of 30m, and a Microwave Wind Scatterometer capable of determining sea surface wind speeds in the range 4 to 24 m/sec. Design philosophy, equipment configuration and intended operation of the Active Microwave Instrumentation package as an end to end radar system, including ground imaging, calibration and data processing requirements are described. Author (ESA)

N84-33991*# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
ERS-1 SYSTEM SIMULATION AND CALIBRATION **c35**
P. Hans, H. M. Braun, and H. Groebke *In* ESA IGARSS 84 Remote Sensing: From Res. Towards Operational Use, Vol. 2 Aug. 1984 p 841-846 refs (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 14B

The ERS-1 Radar systems cannot totally be tested on ground, so comprehensive system simulators, able to take test results of system elements and simulate the entire system chains to derive the end-to-end measurement performances are proposed. After launch and stabilization of the spacecraft and the orbit, the inflight calibration is performed by comparison of the ERS-1 measurements with ground truth information and tuning of the target models, supported by simulations to identify whether an error is caused by the system or a model uncertainty. Author (ESA)

N84-33992*# Marconi Space and Defence Systems Ltd., Portsmouth (England)
VERIFICATION TECHNIQUES FOR SATELLITE-BORNE SYNTHETIC APERTURE RADARS **c32**
R. P. Cox and F. G. Sawyer *In* ESA IGARSS 84 Remote Sensing : From Res. Towards Operational Use, Vol. 2 Aug. 1984 p 847-852 (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 17I

Techniques for the verification of performance of the ERS-1 SAR hardware on the ground and in flight are discussed. The geophysical image quality parameters to be verified and the design stages to obtain the hardware requirements are summarized. Experience shows that verification against geophysical parameters on-orbit is inherently of an undesirably low accuracy. It appears impossible to verify certain parameters and it could be argued that an unverifiable parameter should never form a part of the requirement. The plans for verification should be laid early in any program because the verification of the performance cannot be separated from the design of the sensor. Author (ESA)

N84-33993*# Marconi Space and Defence Systems Ltd., Portsmouth (England)
THE IN-FLIGHT CALIBRATION OF A SATELLITE-BORNE WIND SCATTEROMETER **c35**
D. J. Q. Carter and P. Hans (Dornier-Werke G.m.b.H., Friedrichshafen, West Germany) *In* ESA IGARSS 84 Remote Sensing: From Res. Towards Operational Use, Vol. 2 Aug. 1984 p 853-858 (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 14B

Calibration of the ERS-1 wind scatterometer (SCATT) is described. Due to the large measurement site required to absolutely calibrate the Scatterometer across its entire coverage region (500 Km) with one look, the external calibration has to be split into more than one activity. The method firstly calibrates the SCATT relatively across the swath using the Brazilian Rain Forest, and then absolutely calibrates three points within the swath using transponders. During this latter stage a cross-calibration figure can be obtained between the three antennas as all look at the three transponders during one pass of the site. The internal calibration pulse is obtained by coupling out a portion of the transmitted RF pulse passing it through an attenuator and coupling the RF pulse into the receive path of the instrument. Author (ESA)

N84-33994*# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
THE ERS-1 GROUND SEGMENT
Rolf H. Katzenbeisser *In* ESA IGARSS 84 Remote Sensing: From Res. Towards Operational Use, Vol. 2 Aug. 1984 p 859-864 refs (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 17B

The ERS-1 ground segment and its relation to the ERS-1 satellite are presented. Satellite features on the downlinks and the on-board recording and playback are described. The ERS-1 program calls for one dedicated principal ground station at Kiruna which provides thematic products in near real-time on a regular basis. These fast delivery products are described and the related processing requirements are outlined. The design of the Kiruna station is presented and its elements are sketched. Author (ESA)

N84-33995*# Marconi Co. Ltd., Chelmsford (England).
DIRECT AND INVERSE METHODS FOR OCEAN-WAVE IMAGING BY SAR **c32**
S. Rotheram and J. T. Macklin *In* ESA IGARSS 84 Remote Sensing: From Res. Towards Operational Use, Vol. 2 Aug. 1984 p 865-870 refs Sponsored in part by ESA Original contains color illustrations (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 17I

The direct and inverse problems for ocean-wave imaging by SAR for the image and its power spectrum are discussed. The direct problem is reasonably well understood, but the inverse methods are not complete or optimum. However, they represent the first steps in the development of such methods, and they confirm aspects of imaging theory. Other aspects, particularly for the power spectrum, remain to be completed. Once this is done, optimum methods could be developed using Bacchus-Gilbert theory to provide the required tradeoff between resolution and speckle.
Author (ESA)

N84-33996*# Centre National de la Recherche Scientifique, Strasbourg (France). Lab. de Cartographie Thematique.
A TEXTURAL IMAGE OF ALGIERS [UNE IMAGE TEXTURALE D'ALGER]
S. Rimbert and A. Serradj *In* ESA IGARSS 84 Remote Sensing: From Res. Towards Operational Use, Vol. 2 Aug. 1984 p 871-875 refs In FRENCH (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 05B

A geometrical operator (ETOILE) for processing LANDSAT images is presented. The operator exploits the fact that in urban areas lines are much closer and more complex. To distinguish town from countryside, the operator is sensitive to a high frequency of change in lineaments. It is used in a classic multidimensional classification scheme. The operator was used to map urbanisation of the area around Algiers. Author (ESA)

N84-33997*# European Space Agency, Paris (France). Earthnet.
EUROPEAN PLANS FOR HANDLING OFF-LINE TASKS OF THE ERS-1 c82
L. Marelli, A. Haskell (RAE, Farnsborough, Engl.), J. Gredel (DFVLR, West Germany), and Stanislas (Centre National pour l'Exploitation des Oceans, France) *In* ESA IGARSS 84 Remote Sensing: From Res. Towards Operational Use, Vol. 2 Aug. 1984 p 877-880 (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 05B

The ERS-1 off-line activities as planned through cooperation between ESA and national organizations are discussed. It is planned to operate the Low Bit Rate (LBR) data sensors on a 100% duty cycle over water and ice. The LBR data can be read out in real time and/or recorded on-board and later played back to a full 100' orbit swath of LBR data. The SAR imaging mode can only provide data in real time through a high bit rate downlink. Program committments include the acquisition and recording of LBR global data and that of SAR over Europe and Canada plus the generation, within 3 hr of sensing, of geophysical parameters. Author (ESA)

N84-33998# Defense Mapping Agency Hydrographic and Topographic Center, Washington, D.C.
THE DERIVATION OF THE MAPPING EQUATIONS AND DISTORTION FORMULAE FOR THE SATELLITE TRACKING MAP PROJECTIONS Final Report M.S. Thesis
Gregory Cote Arnold 1984 70 p
(AD-A143683) Avail: NTIS HC A04/MF A01 CSCL 22/3

Rigorous derivations of the Satellite Tracking conic and cylindrical projections are presented. The first fundamental quantities of the projection surface parameters as functions of spherical earth parameters are developed. Using these quantities, newly derived in this paper, general equations of the distortion in length, area, and azimuth are developed. Examples of the graticule and distortion values are given for the LANDSAT orbit.
Author (GRA)

N84-33999# Department of Natural Resources, Olympia, Wash. Div. of Geology and Earth Resources.
SUMMARY OF GEOTHERMAL EXPLORATION ACTIVITY IN THE STATE OF WASHINGTON FROM 1978 - 1983 Final Report
Michael A. Korosec Jan. 1984 45 p refs
(Contract DE-AC07-79ET-27014)
(DE84-014863; DOE/ET-27014/T19; OFR-84-2) Avail: NTIS HC A03/MF A01

Project activity is summarized with references to the publications produced. Project findings are reported as they relate to specific geothermal resource target areas. Some major projects of the geothermal exploration program are: thermal and mineral spring chemistry, heat flow drilling, temperature gradient measurements, Cascade Range regional gravity, geohydrology study of the Yakima area, low temperature geothermal resources, geology, geochemistry of Cascade Mountains volcanic rocks, and soil mercury studies. DOE

N84-34000# Hawaii Univ., Honolulu.
EXPLORATORY ENERGY RESEARCH PROGRAM OF THE UNIVERSITY OF HAWAII AT MANOA Annual Technical Progress Report, 1 Jun. 1982 - 31 May 1983
1983 116 p
(Contract DE-FG03-81ER-10250)
(DE84-014910; DOE/ER-10250/T3) Avail: NTIS HC A06/MF A01

Progress is reported for the following: (1) solar energy laboratory for the roof of Holmes Hall; (2) a freon boiler for alternate energy power cycles; (3) boilin heat transfer in geothermal systems; (4) building energy conservation in Hawaii; (5) combustion properties of biomass pyrolysis products; (6) concentrator solar cell development; (7) materials problems in natural energy development; (8) sail assisted technology for Pacific marine transportation; (9) electrochemical evaluation of hydrogen systems storage in transition metal hydrides; (10) seismic and thermal properties of Hawaiian basalts; (11) chemical dynamics of Ocean Thermal Energy Conversion OTEC clorination; and (12) studies of the interaction of hydrogen and deuterium with transition metals and their alloys at high pressure. DOE

N84-34001# Centre d'Etude Spatiale des Rayonnements, Toulouse (France).
INVESTIGATION OF TEXTURING FUNCTIONS. APPLICATION TO ECOGRAPHICAL ZONING AND TO MAPPING LAND USE IN A SLOPING BASIN: THE AVEYRON Progress Report, July 1981-June 1983 [RECHERCHE DE FONCTIONS TEXTURANTES, APPLICATIONS AU ZONAGE ECONOGRAPHIQUE ET A LA CARTOGRAPHIE DE L'OCCUPATION DES TERRES D'UN BASSIN VERSANT: L'AVEYRON]
G. Flouzat Sep. 1983 65 p refs In FRENCH Sponsored by CNRS
(CESR-83-1089) Avail: NTIS HC A04/MF A01

The use of computer aided mapping and satellite remote sensing to draw up a land use map of a river basin to facilitate hydrobiological management is described. A texture analysis theory compatible with analytical photointerpretation was developed. A second order image processing method was used.
Author (ESA)

N84-34002# Hovemere Ltd., Sevenoaks (England).
FEASIBILITY STUDY ON THE APPLICATION OF FABRY-PEROT INTERFEROMETRY AND IMAGING PHOTON DETECTORS TO OCEAN COLOUR MONITORING
D. Rees Paris ESA Nov. 1983 37 p refs
(Contract ESA-5242/82/F-CG(SC))
(OMD/HVM-83; ESA-CR(P)-1888) Avail: NTIS HC A03/MF A01

The application of imaging photon detectors and Fabry-Perot (FP) interferometers to ocean color monitor (OCM) and Fraunhofer line discriminator (FLD) instrumentation for the recovery of ocean surface chlorophyl concentrations from an orbiting spacecraft was investigated. The spatial and spectral performance of the separate elements in the instruments are evaluated. The signal, noise and background levels detected by an operational instrument are discussed. Practical aspects of the design and interface requirements of a first-generation imaging OCM or FLD are investigated, and the trade-off between S/N ratio, the credibility of data recovered by the instruments and the cost and complexity of the instruments are examined. The imaging photon detector (IPD) is useful due to the relative ease with which very high quality multispectral channel data can be obtained. An FLD, based on a FP interferometer and an IPD is feasible, but it is impractical to

obtain a spatial resolution of 1 km or less, without using either very large optics or a very complex detector strategy.
Author (ESA)

N84-34003# European Space Agency, Paris (France).
OCEAN COLOR WORKING GROUP REPORT TO ESA OBSERVATION ADVISORY COMMITTEE Progress Report
R. Frassetto, M. Reynolds, A. Morel, H. vanderPiepen, D. Spitzer, P. Y. Deschamps, and P. Holligan Jun. 1984 60 p refs Original contains color illustrations
(ESA-BR-20; ISSN-0250-1589) Avail: NTIS HC A04/MF A01; ESA, Paris FF 60, Member States, AU, CN and NO (+20% others)

The state of the art in ocean color physics, monitoring and use is reviewed. Applications in marine biology and ecology at global, regional and local scales; coastal process and monitoring; ocean dynamics; climate research (carbon cycle of the sea, energy transfer); fisheries charts; pollution monitoring and inland water are discussed. Ocean color space missions (coastal zone color scanner and ocean color experiment) and planned missions (thematic mapper on LANDSAT-4, multispectral electronic self-scanning radiometer on MOS-1, high-resolution visible sensors on SPOT, metric camera on spacelab) are outlined. Instrument technical requirements and options for an ERS-2 ocean color mission are considered. Author (ESA)

N84-33843# Hokkaido Univ., Sapporo (Japan).
REPORT OF PIT-WALL OBSERVATIONS OF SNOW COVER IN SAPPORO, 1982 - 1983
Yasoich Endo and Eizi Akitaya *In its* Data Rept. Low Temp. Sci. Ser. A: Phys. Sci. 1983 p 1-7 In JAPANESE (For primary document see N84-33842 23-42)
Avail: NTIS HC A05/MF A01

N84-33844# Hokkaido Univ., Sapporo (Japan).
SNOW COVER OBSERVATIONS AT AVALANCHE RESEARCH STATION, TOIKANBETSU, NORTHERN HOKKAIDO, 15 (1982-1983 WINTER)
Tosio Huzioka, Hiromu Shimizu, Eizi Akitaya, Hideki Narita, and Mitsuo Ohizumi *In its* Data Rept. Low Temp. Sci. Ser. A: Phys. Sci. 1983 p 9-23 refs In JAPANESE (For primary document see N84-33842 23-42)
Avail: NTIS HC A05/MF A01

N84-33845# Hokkaido Univ., Sapporo (Japan).
RADIATION MEASUREMENT OF SNOWY SEASON IN 1982-1983 AT SAPPORO
Nobuyoshi Ishikawa, Kenji Kojima, Hideaki Motoyama, and Yoshinori Yamada *In its* Data Rept. Low Temp. Sci. Ser. A: Phys. Sci. 1983 p 25-31 refs In JAPANESE (For primary document see N84-33842 23-42)
Avail: NTIS HC A05/MF A01

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N84-34004 Department of the Air Force, Washington, D.C.
SOLAR ENERGY CONCENTRATOR SYSTEM Patent
F. A. Folino, inventor (to Air Force) Issued 12 Jun. 1984 11 p Supersedes AD-D009240
(AD-D011149; US-Patent-4,454,371; US-Patent-Appl-SN-326972; US-Patent-Class-136-246) Avail: US Patent and Trademark Office CSCL 10/2

A solar energy concentrator system having a plurality of concentrator arrays with each of the arrays being made up of a plurality of adjacent longitudinally extending concentrator modules is discussed. Each of the concentrator modules has a semi-cylindrically-shaped housing and a semi-cylindrically-shaped cover in order to form an overall cylindrically-shaped structure which provides protection from adverse environmental conditions and withstands high wind loads. Situated within the cover and connected to the housing is a parabolically-shaped concentrator. The concentrator is made up of a plurality of parallelogram-shaped reflector panels mounted adjacent one another on a bias. This arrangement permits the ends of the panels to overlap adjacent modules so as to provide a substantially continuous reflector surface. GRA

N84-34005 Fachinformationszentrum fuer Energie, Physik, Mathematik G.m.b.H., Eggenstein-Leopoldshafen (West Germany).
INFORMATION PACKAGE: WINDPOWER UTILIZATION [INFORMATIONSPAKET: NUTZUNG DER WINDERENERGIE]
Johanna Grewen, ed. Jan. 1982 171 p refs In GERMAN Sponsored by Bundesministerium fuer Forschung und Technologie
Copyright. Avail: Issuing Activity

The utilization of wind energy for the production of electric power is treated. The large wind energy research project GROWIAN is described. Advice for private users of windpower energy is given. Possibilities of windpower utilization for heating of buildings are explained. The wind conditions in Germany are treated with a view to windpower utilization. For individual titles, see N84-34006 through N84-34010.

N84-34006 Bundesministerium fuer Forschung und Technologie, Bonn (West Germany).
WINDPOWER UTILIZATION FROM THE POINT OF VIEW OF THE FEDERAL MINISTRY OF RESEARCH AND TECHNOLOGY [WINDENERGIENUTZUNG AUS DEM BLICKWINKEL DES BUNDESMINISTERIUMS FUER FORSCHUNG UND TECHNOLOGIE]
K. Matthes *In* Fachinformationszentrum fuer Energie, Physik, Mathematik G.m.b.H. Inform. Package: Windpower Utilization Jan. 1982 p 8-10 In GERMAN (For primary document see N84-34005 23-44)
Copyright. Avail: Issuing Activity

West German wind energy policy is reviewed. Since 1977 the expenses increased yearly by more than 100%, and amounted to 45 million DM in 1980. If windpower systems have to cover an appreciable part of the energy needs, windpower has to be exploited on a large technical scale. Even small systems have to be analysed more carefully than hitherto thought. The use of low power technologies often has considerable advantages, and not only for developing countries. Author (ESA)

N84-34007 Fachinformationszentrum fuer Energie, Physik, Mathematik G.m.b.H., Eggenstein-Leopoldshafen (West Germany).
WINDPOWER UTILIZATION POSSIBILITIES [NUTZUNGSMOEGLICHKEITEN DER WINDENERGIE]
Ch. Hoetzel *In its* Inform. Package: Windpower Utilization Jan. 1982 p 17-22 In GERMAN (For primary document see N84-34005 23-44)
Copyright. Avail: Issuing Activity

The possibilities of windpower utilization for mechanical pumps, electric generators, mechanical water vortex pumps, and heat pumps are reviewed. Application possibilities can be realized by windpower systems of different size. It must however be determined for which purpose and for which power range they are used. The site and the concomitant wind potential is of utmost importance. Small units in the 10 kW power range are very interesting for autonomous or semiautonomous energy supply. Author (ESA)

N84-34008 Maschinenfabrik Augsburg-Nuernberg A.G., Munich (West Germany).
WIND ENERGY: LARGE WINDPOWER SYSTEMS TO PRODUCE ELECTRIC ENERGY [WINDENERGIE: GROSSE WINDKRAF-

TANLAGEN ZUR ERZEUGUNG ELEKTRISCHER ENERGIE]
Erich Hau *In* Fachinformationszentrum fuer Energie, Physik, Mathematik G.m.b.H. Inform. Package: Windpower Utilization Jan. 1982 p 25-41 refs In GERMAN (For primary document see N84-34005 23-44)
Copyright. Avail: Issuing Activity

Technologies used in wind energy systems are described. The connection of large windpower plants to the electric grid, and the supply of single large consumers in so-called island operation are presented. Economic factors, ecological questions, and future developments are treated. Author (ESA)

N84-34009 Kernforschungsanlage, Juelich (West Germany).
GROWIAN: ELECTRIC CURRENT FROM WIND ENERGY [GROWIAN: STORM AUS WINDENERGIE]
R. Windheim *In* Fachinformationszentrum fuer Energie, Physik, Mathematik G.m.b.H. Inform. Package: Windpower Utilization Jan. 1982 p 42-43 In GERMAN (For primary document see N84-34005 23-44)
Copyright. Avail: Issuing Activity

The wind energy research project GROWIAN is described. The GROWIAN 1 with a nominal electric power of 3MW will be the largest wind energy system in the world. At the planned site at the mouth of the river Elbe, it is going to produce 12 GWhr per year. It can cover the yearly energy requirements of 250 one-family houses (heating included) or supply electricity to 4000 households, or save 3.5 million liters of fuel for a fuel fired power plant. Author (ESA)

N84-34010 Fachinformationszentrum fuer Energie, Physik, Mathematik G.m.b.H., Eggenstein-Leopoldshafen (West Germany).
ADVICE FOR WINDPOWER USERS [TIPS FUER WINDKRAFTANWENDER]
Walter Stephenson *In its* Inform. Package Windpower Utilization Jan. 1982 p 53-57 In GERMAN (For primary document see N84-34005 23-44)
Copyright. Avail: Issuing Activity

Advice for private users of windpower energy is given. Type of energy needed; amount of energy expected from windpower systems; cost effectiveness; autonomous operation versus connection to the national grid; and high and low speed systems are discussed. Author (ESA)

N84-34011*# Stanford Univ., Calif. Dept. of Materials Science and Engineering.
MATERIALS FOR HIGH-TEMPERATURE THERMOELECTRIC CONVERSION Annual Technical Report
R. S. Feigelson, D. Elwell, and B. Auld Apr. 1984 59 p refs
(Contract NAGw-268)
(NASA-CR-173969; NAS 1.26:173969; CMR-P-84-3) Avail: NTIS HC A04/MF A01 CSCL 10A

The development of materials for high temperature thermoelectric energy conversion devices was investigated. The development of new criteria for the selection of materials which is based on understanding of the fundamental principles governing the behavior of high temperature thermoelectric materials is discussed. The synthesis and characterization of promising new materials and the growth of single crystals to eliminate possible problems associated with grain boundaries and other defects in polycrystalline materials are outlined. E.A.K.

N84-34012*# Westinghouse Electric Corp., Pittsburgh, Pa. Advanced Energy Systems Div.
FLAT-PLATE SOLAR ARRAY PROJECT PROCESS DEVELOPMENT AREA, PROCESS RESEARCH OF NON-CZ SILICON MATERIAL Quarterly Report, 1 Apr. - 30 Jun. 1984
R. B. Campbell Jul. 1984 20 p ref
(Contract NAS7-100)
(NASA-CR-173926; DOE/JPL-956616-83-3; NAS 1.26:173926; WAESD-TR-84-0026; QR-3) Avail: NTIS HC A02/MF A01 CSCL 10A

The program is designed to investigate the fabrication of solar cells on N-type base material by a simultaneous diffusion of N-type and P-type dopants to form an P(+)NN(+) structure. The results of simultaneous diffusion experiments are being compared to cells fabricated using sequential diffusion of dopants into N-base material in the same resistivity range. The process used for the fabrication of the simultaneously diffused P(+)NN(+) cells follows the standard Westinghouse baseline sequence for P-base material except that the two diffusion processes (boron and phosphorus) are replaced by a single diffusion step. All experiments are carried out on N-type dendritic web grown in the Westinghouse pre-pilot facility. The resistivities vary from 0.5 (UC OMEGA)cm to 5 (UC OMEGA)cm. The dopant sources used for both the simultaneous and sequential diffusion experiments are commercial metallorganic solutions with phosphorus or boron components. After these liquids are applied to the web surface, they are baked to form a hard glass which acts as a diffusion source at elevated temperatures. In experiments performed thus far, cells produced in sequential diffusion tests have properties essentially equal to the baseline N(+)PP(+) cells. However, the simultaneous diffusions have produced cells with much lower IV characteristics mainly due to cross-doping of the sources at the diffusion temperature. This cross-doping is due to the high vapor pressure phosphorus (applied as a metallorganic to the back surface) diffusion through the SiO2 mask and then acting as a diffusant source for the front surface. DOE

N84-34013*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PHOTOVOLTAIC MODULE ENCAPSULATION DESIGN AND MATERIALS SECTION, VOLUME 2
E. Cuddihy 1 Jun. 1984 107 p refs 2 Vol.
(Contracts NAS7-918; DE-AI01-76ET-20356)
(NASA-CR-173902; DOE/JPL-1012-97-Vol-2; JPL-Pub-84-34-Vol-2; JPL-5101-237-Vol-2; NAS 1.26:173902) Avail: NTIS HC A06/MF A01 CSCL 10A

Tests for chemical structure, material properties, water absorption, aging and curing agent of Ethylene Vinyl Acetate (EVA) and UV absorption studies are carried out. A computer model was developed for thermal optical modeling, to investigate dependence between module operating temperature and solar insolation, and heat dissapation behavior. Structural analyses were performed in order to determine the stress distribution under wind and heat conditions. Curves are shown for thermal loading conditions. An electrical isolation was carried out to investigate electrical stress aging of non-metallic encapsulation materials and limiting material flaws, and to develop a computer model of electrical fields and stresses in encapsulation materials. In addition, a mathematical model was developed and tests were conducted to predict hygroscopic and thermal expansion and contraction on a plastic coated wooden substrate. Thermal cycle and humidity freezing cycle tests, partial discharge tests, and hail impact tests were also carried out. Finally, the effects of soiling on the surface of photovoltaic modules were investigated. Two antisoiling coatings, a fluorinated silane and perflourodecanoic acid were considered. S.B.

N84-34014*# Spectrolab, Inc., Sylmar, Calif.
DEVELOPMENT OF METALLIZATION PROCESS Quarterly Technical Progress Report, period ending 30 Jun. 1983
Alexander Garcia, III Aug. 1983 18 p Sponsored by NASA and DOE Prepared for JPL, Pasadena, Calif.
(Contract JPL-956205)
(NASA-CR-173956; DOE/JPL-956205-83/4; JPL-9950-879; NAS 1.26:173956; QTPR-6329-15) Avail: NTIS HC A02/MF A01 CSCL 10A

A non lead frit paste is evaluated. A two step process is discussed where the bulk of the metallization is Mo/Sn but a small ohmic pad is silver. A new matrix of paste formulations is developed. A variety of tests are performed on paste samples to determine electrical, thermal and structural properties. M.A.C.

N84-34015*# Hemlock Semiconductor Corp., Mich.
DEVELOPMENT OF A POLYSILICON PROCESS BASED ON CHEMICAL VAPOR DEPOSITION, PHASE 1 AND PHASE 2 Final

Report, 6 Oct. 1979 - 25 Jun. 1982
F. Plahutnik, A. Arvidson, D. Sawyer, and K. Sharp Aug. 1982 48 p refs Sponsored in part by DOE Prepared for JPl
(Contract JPL-955533)
(NASA-CR-173957; JPL-9950-889; DOE/JPL-955533-83/7; NAS 1.26:173957; DRL-125; DRD-SE-2) Avail: NTIS HC A03/MF A01 CSCL 10A

High-purity polycrystalline silicon was produced in an experimental, intermediate and advanced CVD reactor. Data from the intermediate and advanced reactors confirmed earlier results obtained in the experimental reactor. Solar cells were fabricated by Westinghouse Electric and Applied Solar Research Corporation which met or exceeded baseline cell efficiencies. Feedstocks containing trichlorosilane or silicon tetrachloride are not viable as etch promoters to reduce silicon deposition on bell jars. Neither are they capable of meeting program goals for the 1000 MT/yr plant. Post-run CH1 etch was found to be a reasonably effective method of reducing silicon deposition on bell jars. Using dichlorosilane as feedstock met the low-cost solar array deposition goal (2.0 gh-1-cm-1), however, conversion efficiency was approximately 10% lower than the targeted value of 40 mole percent (32 to 36% achieved), and power consumption was approximately 20 kWh/kg over target at the reactor. S.B.

N84-34016*# Spectrolab, Inc., Sylmar, Calif.
DESIGN, ANALYSIS AND TEST VERIFICATION OF ADVANCED ENCAPSULATION SYSTEMS Triannual Report, period ending 31 Jul. 1983
Alexander Garcia, III Nov. 1983 101 p refs Sponsored by NASA and DOE Prepared for JPL, Pasadena, Calif.
(Contract JPL-955567)
(NASA-CR-173955; DOE/JPL-95567-83/12; JPL-9950-891; NAS 1.26:173955) Avail: NTIS HC A06/MF A01 CSCL 10A

The analytical methodology for advanced encapsulation designs for the development of photovoltaic modules is presented. Analytical models are developed to test optical, thermal, electrical and structural properties of the various encapsulation systems. Model data is compared to relevant test data to improve model accuracy and develop general principles for the design of photovoltaic modules. M.A.C.

N84-34017*# Westinghouse Electric Corp., Pittsburgh, Pa. Cell and Module Formation Research Area.
PROCESS RESEARCH OF NON-CZ SILICON MATERIAL Final Report, 26 Nov. 1980 - 30 Sep. 1983
1983 307 p
(Contract JPL-955909)
(NASA-CR-173954; DOE/JPL-955909-83/11; NAS 1.26:173954; WAESD-TR-83-1007; DRL-157; DRD-SE-3) Avail: NTIS HC A14/MF A01 CSCL 10A

High risk, high payoff research areas associated with the Westinghouse process for producing photovoltaic modules using non- CZ sheet material were investigated. All work was performed using dendritic web silicon. The following tasks are discussed and associated technical results are given: (1) determining the technical feasibility of forming front and back junctions in non-CT silicon using dopant techniques; (2) determining the feasibility of forming a liquid applied diffusion mask to replace the more costly chemical vapor deposited SiO2 diffusion mask; (3) determining the feasibility of applying liquid anti-reflective solutions using meniscus coating equipment; (4) studying the production of uniform, high efficiency solar cells using ion implanation junction formation techniques; and (5) quantifying cost improvements associated with process improvements. R.S.F.

N84-34018*# Mobil Tyco Solar Energy Corp., Waltham, Mass.
STRESS STUDIES IN EFG Quarterly Progress Report, 1 Jul. - 30 Sep. 1983
15 Dec. 1983 37 p refs Sponsored in part by DOE Prepared for JPL
(Contract JPL-956312)
(NASA-CR-173960; DOE/JPL-957312/05; NAS 1.26:173960) Avail: NTIS HC A03/MF A01 CSCL 10A

Experimental work in support of stress studies in high speed silicon sheet growth has been emphasized in this quarter. Creep experiments utilizing four-point bending have been made in the temperature range from 1000 C to 1360 C in CZ silicon as well as on EFG ribbon. A method to measure residual stress over large areas using laser interferometry to map strain distributions under load is under development. A fiber optics sensor to measure ribbon temperature profiles has been constructed and is being tested in a ribbon growth furnace environment. Stress and temperature field modeling work has been directed toward improving various aspects of the finite element computing schemes. Difficulties in computing stress distributions with a very high creep intensity and with non-zero interface stress have been encountered and additional development of the numerical schemes to cope with these problems is required. Temperature field modeling has been extended to include the study of heat transfer effects in the die and meniscus regions. B.W.

N84-34019*# Westinghouse Electric Corp., Pittsburgh, Pa.
LARGE-AREA SHEET TASK ADVANCED DENDRITIC WEB GROWTH DEVELOPMENT Annual Report, 23 Oct. 1982 - 22 Oct. 1983
C. S. Duncan, R. G. Seidensticker, and J. P. McHugh 13 Jan. 1984 54 p refs Sponsored in part by DOE Prepared for JPL
(Contract JPL-955843)
(NASA-CR-173958; DOE/JPL-955843-84/12; NAS 1.26:173958; DRD-SE-5; DRD-139) Avail: NTIS HC A04/MF A01 CSCL 10A

The thermal models used for analyzing dendritic web growth and calculating the thermal stress were reexamined to establish the validity limits imposed by the assumptions of the models. Also, the effects of thermal conduction through the gas phase were evaluated and found to be small. New growth designs, both static and dynamic, were generated using the modeling results. Residual stress effects in dendritic web were examined. In the laboratory, new techniques for the control of temperature distributions in three dimensions were developed. A new maximum undeformed web width of 5.8 cm was achieved. A 58% increase in growth velocity of 150 micrometers thickness was achieved with dynamic hardware. The area throughput goals for transient growth of 30 and 35 sq cm/min were exceeded. Author

N84-34020*# Optical Coating Lab., Inc., City of Industry, Calif. Photoelectronics Div.
SILICON SOLAR CELL PROCESS DEVELOPMENT, FABRICATION AND ANALYSIS Quarterly Report, 1 Mar. - 30 Jun. 1983
D. C. Leung and P. A. Iles 30 Jun. 1983 21 p refs Sponsored in part by DOE Prepared for JPL
(Contract JPL-955089)
(NASA-CR-173950; DOE/JPL-955089-83/17; NAS 1.26:17395; QR-13) Avail: NTIS HC A02/MF A01 CSCL 10A

Measurements of minority carrier diffusion lengths were made on the small mesa diodes from HEM Si and SILSO Si. The results were consistent with previous Voc and Isc measurements. Only the medium grain SILSO had a distinct advantage for the non grain boundary diodes. Substantial variations were observed for the HEM ingot 4141C. Also a quantitatively scaled light spot scan was being developed for localized diffusion length measurements in polycrystalline silicon solar cells. A change to a more monochromatic input for the light spot scan results in greater sensitivity and in principle, quantitative measurement of local material qualities is now possible. Author

N84-34021*# Westinghouse Electric Corp., Pittsburgh, Pa. Advanced Energy Systems Div.
PROGRESS RESEARCH OF NON-Cz SILICON MATERIAL Quarterly Report, 4 Nov. - 31 Dec. 1983
R. B. Campbell 31 Dec. 1983 16 p refs Sponsored in part by DOE Prepared for JPL
(Contract JPL-956616)
(NASA-CR-173949; DOE/JPL-956616-1; NAS 1.26:173949; WAESD-TR-84-0001; QR-1) Avail: NTIS HC A02/MF A01 CSCL 10A

The simultaneous diffusion of liquid boron and liquid phosphorus

dopants into N-type dendritic silicon web for solar cells was investigated. It is planned that the diffusion parameters required to achieve the desired P(+)NN(+) cell structure be determined and the resultant cell properties be compared to cells produced in a sequential differential process. A cost analysis of the simultaneous junction formation process is proposed. R.S.F.

N84-34022*# Spectrolab, Inc., Sylmar, Calif.
DEVELOPMENT OF METALLIZATION PROCESS: FSA PROJECT, CELL AND MODULE FORMATION RESEARCH AREA Quarterly Technical Progress Report, period ending 30 Sep. 1983
Alexander Garcia, III Nov. 1983 21 p refs Sponsored in part by DOE Prepared for JPL
(Contract JPL-956205)
(NASA-CR-173951; DOE/JPL-956205-83/6; NAS 1.26:173951; QTPR-8329-18) Avail: NTIS HC A02/MF A01 CSCL 10A

This experiment is involved in determining bulk resistivity values for different past concentrations. Experiments were performed on silicon Cz and non-Cz wafers. To determine bulk resistivity more accurately, pastes were printed on ceramic substrates. Contact resistance was determined by measuring the voltage drop at constant current. Because of irregularity of grid profiles, accurate determination of cross sections of grid lines is difficult. The bulk resistivity is accurate when the resistivity of the metallization is much less than that of the layer beneath it. When the resistivity of the metal approaches that of the substrate, the actual resistivity will be larger than the measured value. S.B.

N84-34023*# Illinois Univ., Chicago. Dept. of Civil Engineering, Mechanics and Metallurgy.
SURFACE PROPERTY MODIFICATION OF SILICON Progress Report
Steven Danyluk Jan. 1984 84 p refs Sponsored in part by DOE Prepared for JPL
(Contract JPL-956053)
(NASA-CR-173952; JPL-9950-914; DOE/JPL-956053-84/05; NAS 1.26:173952) Avail: NTIS HC A05/MF A01 CSCL 10A

The main emphasis of this work has been to determine the wear rate of silicon in fluid environments and the parameters that influence wear. Three tests were carried out on single crystal Czochralski silicon wafers: circular and linear multiple-scratch tests in fluids by a pyramidal diamond simulated fixed-particle abrasion; microhardness and three-point bend tests were used to determine the hardness and fracture toughness of abraded silicon and the extent of damage induced by abrasion. The wear rate of (100) and (111) n and p-type single crystal Cz silicon abraded by a pyramidal diamond in ethanol, methanol, acetone and de-ionized water was determined by measuring the cross-sectional areas of grooves of the circular and linear multiple-scratch tests. The wear rate depends on the loads on the diamond and is highest for ethanol and lowest for de-ionized water. The surface morphology of the grooves showed lateral and median cracks as well as a plastically deformed region. The hardness and fracture toughness are critical parameters that influence the wear rate. Microhardness tests were conducted to determine the hardness as influenced by fluids. Median cracks and the damage zone surrounding the indentations were also related to the fluid properties. B.W.

N84-34024*# Spire Corp., Bedford, Mass.
DEVELOPMENT AND FABRICATION OF A SOLAR CELL JUNCTION PROCESSING SYSTEM Draft Final Report
Jun. 1984 135 p refs Sponsored in part by DOE Prepared for JPL
(Contracts NAS7-100; JPL-955640)
(NASA-CR-174948; DOE/JPL-955643/83; NAS 1.26:174948; FR-10073) Avail: NTIS HC A07/MF A01 CSCL 10A

A processing system capable of producing solar cell junctions by ion implantation followed by pulsed electron beam annealing was developed and constructed. The machine was to be capable of processing 4-inch diameter single-crystal wafers at a rate of 10(7) wafers per year. A microcomputer-controlled pulsed electron beam annealer with a vacuum interlocked wafer transport system was designed, built and demonstrated to produce solar cell junctions on 4-inch wafers with an AMI efficiency of 12%. Experiments showed that a non-mass-analyzed (NMA) ion beam could implant 10 keV phosphorous dopant to form solar cell junctions which were equivalent to mass-analyzed implants. A NMA ion implanter, compatible with the pulsed electron beam annealer and wafer transport system was designed in detail but was not built because of program termination. Author

N84-34025*# Research Triangle Inst., Research Triangle Park, N.C.
COMPREHENSIVE SILICON SOLAR CELL COMPUTER MODELING Quarterly Progress Report, 5 Jan. - 4 Apr. 1984
M. F. Lamorte Jun. 1984 51 p refs Sponsored in part by DOE Prepared for JPL
(Contract JPL-956741)
(NASA-CR-173953; JPL-9950-924; DOE/JPL-956741-81/01; NAS 1.26:173953; QPR-1) Avail: NTIS HC A04/MF A01 CSCL 10A

The development of an efficient, comprehensive Si solar cell modeling program that has the capability of simulation accuracy of 5 percent or less is examined. A general investigation of computerized simulation is provided. Computer simulation programs are subdivided into a number of major tasks: (1) analytical method used to represent the physical system; (2) phenomena submodels that comprise the simulation of the system; (3) coding of the analysis and the phenomena submodels; (4) coding scheme that results in efficient use of the CPU so that CPU costs are low; and (5) modularized simulation program with respect to structures that may be analyzed, addition and/or modification of phenomena submodels as new experimental data become available, and the addition of other photovoltaic materials. M.A.C.

N84-34026*# Solarex Corp., Rockville, Md.
PROCESS RESEARCH OF POLYCRYSTALLINE SILICON MATERIAL (PROPSM) Quarterly Report, 1 Jan. - 31 Mar. 1984
J. S. Culik 31 Mar. 1984 28 p refs Sponsored by NASA and DOE Prepared for JPL, Pasadena, Calif.
(Contract JPL-956698)
(NASA-CR-173934; DOE/JPL-956698-84/2; NAS 1.26:173934; QR-2) Avail: NTIS HC A03/MF A01 CSCL 10A

A passivation process (hydrogenation) that will improve the power generation of solar cells fabricated from presently produced, large grain, cast polycrystalline silicon (Semix), a potentially low cost material are developed. The first objective is to verify the operation of a DC plasma hydrogenation system and to investigate the effect of hydrogen on the electrical performance of a variety of polycrystalline silicon solar cells. The second objective is to parameterize and optimize a hydrogenation process for cast polycrystalline silicon, and will include a process sensitivity analysis. The sample preparation for the first phase is outlined. The hydrogenation system is described, and some early results that were obtained using the hydrogenation system without a plasma are summarized. Light beam induced current (LBIC) measurements of minicell samples, and their correlation to dark current voltage characteristics, are discussed. B.G.

N84-34027*# Spire Corp., Bedford, Mass.
EXCIMER LASER ANNEALING TO FABRICATE LOW COST SOLAR CELLS Quarterly Technical Report, 26 Mar. - 30 Jun. 1984
Jul. 1984 37 p refs Sponsored in part by DOE Prepared for JPL
(Contract JPL-956797)
(NASA-CR-173938; DOE/JPL-956797/01; JPL-9950-936; NAS 1.26:173938; QR-10092-01; QR-1) Avail: NTIS HC A03/MF A01 CSCL 10A

The objective is to show whether or not pulsed excimer laser annealing (PELA) of ion-implanted junctions is a cost effective replacement for diffused junctions in fabricating crystalline silicon solar cells. The preliminary economic analysis completed shows that the use of PELA to fabricate both the front junction and back surface field (BSF) would cost approximately 35 cents per peak watt (Wp), compared to a cost of 15 cents/Wp for diffusion,

aluminum BSF and an extra cleaning step in the baseline process. The cost advantage of the PELA process depends on improving the average cell efficiency from 14% to 16%, which would lower the overall cost of the module by about 15 cents/Wp. An optimized PELA process compatible with commercial production is to be developed, and increased cell efficiency with sufficient product for adequate statistical analysis demonstrated. An excimer laser annealing station was set-up and made operational. The first experiment used 248 nm radiation to anneal phosphorus implants in polished and texture-etched silicon. Author

N84-34028*# Spectrolab, Inc., Sylmar, Calif.
DESIGN, ANALYSIS AND TEST VERIFICATION OF ADVANCED ENCAPSULATION SYSTEMS Triannual Report, period ending 31 Mar. 1984
Alexander Garcia, III Aug. 1984 68 p refs Sponsored in part by DOE Prepared for JPL
(Contract JPL-055567)
(NASA-CR-173941; DOE/JPL-955567-84/14; JPL-9950-939; NAS 1.26:173941; DRL-126) Avail: NTIS HC A04/MF A01 CSCL 10A

Investigations into transparent conductive polymers were begun. Polypyrrole was electrochemically deposited, but the film characteristics were poor. A proprietary polymer material supplied by Polaroid was evaluated and showed promise as a readily processable material. A method was developed for calculating the magnitude and location of the maximum electric field for the family of solar-cell-like shapes. A method for calculating the lines of force for three dimensional electric fields was developed and applied to a geometry of interest to the photovoltaic program. B.G.

N84-34029*# Springborn Labs., Inc., Enfield, Conn.
INVESTIGATION OF TEST METHODS, MATERIAL PROPERTIES AND PROCESSES FOR SOLAR CELL ENCAPSULANTS Quarterly Progress Report
P. B. Willis and B. Baum Nov. 1983 23 p Sponsored in part by DOE Prepared for JPL
(Contract JPL-954527)
(NASA-CR-173940; JPL-9950-940; DOE/JPL-954527-26; NAS 1.26:173940; QPR-26) Avail: NTIS HC A02/MF A01 CSCL 10A

The goal of the program is to identify, test, evaluate and recommend encapsulation materials and processes for the fabrication of cost-effective and long life solar modules. Of the $18 (1948 $) per square meter allocated for the encapsulation components approximately 50% of the cost ($9/sq m) may be taken by the load bearing component. Due to the proportionally high cost of this element, lower costing materials were investigated. Wood based products were found to be the lowest costing structural materials for module construction, however, they require protection from rainwater and humidity in order to acquire dimensional stability. The cost of a wood product based substrate must, therefore, include raw material costs plus the cost of additional processing to impart hygroscopic inertness. This protection is provided by a two step, or split process in which a flexible laminate containing the cell string is prepared, first in a vacuum process and then adhesively attached with a back cover film to the hardboard in a subsequent step. B.W.

N84-34030*# Spectrolab, Inc., Sylmar, Calif.
DEVELOPMENT OF METALLIZATION PROCESS. FSA PROJECT, CELL AND MODULE FORMATION RESEARCH AREA Quarterly Technical Progress Report, period ending 30 Jun. 1984
Alexander Garcia, III Jul. 1984 15 p Sponsored in part by DOE Prepared for JPL
(Contract JPL-956205)
(NASA-CR-173959; JPL-6329-27; NAS 1.26:173959) Avail: NTIS HC A02/MF A01 CSCL 10A

New pastes were evaluated that contained additives to aid in the silicon-to-metallization contact. None were completely successful. A reevaluation of the molybdenum oxide paste and the two-step screen printing process was done. The oxide paste did not show promise. The two-step process enabled soldering of the cells but the cells still had a high series resistance. Pastes are on order from a different manufacturer. Author

N84-34031*# Spectrolab, Inc., Sylmar, Calif.
DEVELOPMENT OF METALLIZATION PROCESS Quarterly Technical Progress Report
Alexander Garcia, III Jul. 1984 21 p Sponsored in part by DOE Prepared for JPL
(Contract JPL-956205)
(NASA-CR-173943; JPL-9950-941; DOE/JPL-956205-84/7; NAS 1.26:173943; DRL-175; Rept-6329-24) Avail: NTIS HC A02/MF A01 CSCL 10A

Pastes are evaluated that contain additives to aid in the silicon to metallization contact. None are completely successful. Pastes are evaluated using a heated stage scanning electron microscope (SEM). This equipment shows promise for future evaluations. M.A.C.

N84-34032*# Cornell Univ., Ithaca, N.Y. Dept. of Materials Science and Engineering.
INTERACTIONS OF TWIN BOUNDARIES AND DISLOCATIONS IN SOLAR SILICON Topical Technical Report, 1 Oct. 1983 - 28 Jun. 1984
R. Gleichmann and D. G. Ast Jun. 1984 37 p refs Sponsored in part by DOE Prepared for JPL
(Contract JPL-956046)
(NASA-CR-173942; JPL-9950-943; DOE/JPL-956046-10; NAS 1.26:173942; DRL-162; TTR-10) Avail: NTIS HC A03/MF A01 CSCL 10A

Changes in the defect structure which occur when rapidly grown, edge defined film fed growth silicon ribbons are processed at high temperatures are investigated. Twin boundaries, which comprise the major structural defects in the ribbons act as strong obstacles to dislocation glide. The impedance of dislocation glide, possible mechanisms for slip transfer across twins, and implications for the mechanical and electrical properties of the silicon ribbons are discussed. A model is developed which explains both twin induced grain boundary formation during recovery of the microstructure and also the generation of microtwins and second order twin joins by glide induced twinning processes. M.A.C.

N84-34033*# Solarex Corp., Rockville, Md.
PROCESS RESEARCH OF POLYCRYSTALLINE SILICON MATERIAL (PROPSM) Quarterly Report, 1 Apr. - 30 Jun. 1984
J. S. Culik 30 Jun. 1984 12 p refs Sponsored by NASA and DOE Prepared for JPL, Pasadena, Calif.
(Contract JPL-956698)
(NASA-CR-173935; DOE/JPL-956698-84/3; JPL-9550-944; NAS 1.26:173935; QR-3) Avail: NTIS HC A02/MF A01 CSCL 10A

An investigation was begun into the usefulness of molecular hydrogen annealing on polycrystalline solar cells. No improvement was realized even after twenty hours of hydrogenation. Thus, samples were chosen on the basis of: (1) low open circuit voltage; (2) low shunt conductance; and (3) high light generated current. These cells were hydrogenated in molecular hydrogen at 300 C. The differences between the before and after hydrogenation values are so slight as to be negligible. These cells have light generated current densities that indicate long minority carrier diffusion lengths. The open circuit voltage appears to be degraded, and quasi-neutral recombination current enhanced. Therefore, molecular hydrogen is not usful for passivating electrically active defects. S.B.

N84-34034*# Union Carbide Corp., Tonawanda, N.Y.
LOW COST SOLAR ARRAY PROJECT. EXPERIMENTAL PROCESS SYSTEM DEVELOPMENT UNIT FOR PRODUCING SEMICONDUCTOR-GRADE SILICON USING THE SILANE-TO-SILICON PROCESS Quarterly Progress Report, Jan. - Mar. 1980
Mar. 1980 99 p Sponsored by NASA and DOE Prepared for JPL, Pasadena
(Contract JPL-954334)
(NASA-CR-173936; DOE/JPL-954334-79/14; JPL-9950-360; NAS

1.26:173936) Avail: NTIS HC A05/MF A01 CSCL 10A

Technical activities are reported in the design of process, facilities, and equipment for producing silicon at a rate and price commensurate with production goals for low cost solar cell modules. The silane-silicone process has potential for providing high purity poly-silicon on a commercial scale at a price of fourteen dollars per kilogram by 1986, (1980 dollars). Commercial process, economic analysis, process support research and development, and quality control are discussed. S.B.

N84-34035*# Eagle-Picher Industries, Inc., Joplin, Mo. Electronic Div.

NICKEL-IRON BATTERY SYSTEM SAFETY Final Report

R. Saltat Jun. 1984 67 p refs Sponsored by NASA and DOE Prepared for JPL, Pasadena, Calif.

(Contract JPL-956465)

(NASA-CR-173937; JPL-9550-910; NAS 1.26:173937; DOE/CS-54209/17) Avail: NTIS HC A04/MF A01 CSCL 10C

The generated flow rates of gaseous hydrogen and gaseous oxygen from an electrical vehicle nickel-iron battery system were determined and used to evaluate the flame quenching capabilities of several candidate devices to prevent flame propagation within batteries having central watering/venting systems. The battery generated hydrogen and oxygen gases were measured for a complete charge and discharge cycle. The data correlates well with accepted theory during strong overcharge conditions indicating that the measurements are valid for other portions of the cycle. Tests confirm that the gas mixture in the cells is always flammable regardless of the battery status. The literature indicated that a conventional flame arrestor would not be effective over the broad spectrum of gassing conditions presented by a nickel-iron battery. Four different types of protective devices were evaluated. A foam-metal arrestor design was successful in quenching gaseous hydrogen and gaseous oxygen flames, however; the application of this flame arrestor to individual cell or module protection in a battery is problematic. A possible rearrangement of the watering/venting system to accept the partial protection of simple one-way valves is presented which, in combination with the successful foam-metal arrestor as main vent protection, could result in a significant improvement in battery protection. A.R.H.

N84-34036*# Institute of Gas Technology, Chicago, Ill. Engineering Research Div.

ADVANCED ONBOARD STORAGE CONCEPTS FOR NATURAL GAS-FUELED AUTOMOTIVE VEHICLES Final Report

R. J. Remick, R. H. Elkins, E. H. Camara, and T. Bulicz Jun. 1984 139 p refs

(Contracts DEN3-327; DE-AI01-81CS-50006)

(NASA-CR-174655; DOE/NASA/0327-1; NAS 1.26:174655) Avail: NTIS HC A07/MF A01 CSCL 10B

The evaluation of several advanced concepts for storing natural gas at reduced pressure is presented. The advanced concepts include adsorption on high surface area carbon, adsorption in high porosity zeolite, storage in clathration compounds, and storage by dissolution in liquid solvents. High surface area carbons with high packing density are the best low pressure storage mediums. A simple mathematical model is used to compare adsorption storage on a state of the art carbon with compression storage. The model indicates that a vehicle using adsorption storage of natural gas at 3.6 MPa will have 36 percent of the range, on the EPA city cycle, of a vehicle operating on a compression storage system having the same physical size and a peak storage pressure of 21 MPa. Preliminary experiments and current literature suggest that the storage capacity of state of the art carbons could be improved by as much as 50 percent, and that adsorption systems having a capacity equal to compression storage at 14 MPa are possible without exceeding a maximum pressure of 3.6 MPa. M.A.C.

N84-34037*# Cleveland State Univ., Ohio.

MANUAL OF PHOSPHORIC ACID FUEL CELL POWER PLANT COST MODEL AND COMPUTER PROGRAM Final Report

Cheng-yi Lu and Kalil A. Alkasab May 1984 39 p refs

(Contracts NCC3-17; DE-AI21-80ET-17088)

(NASA-CR-174720; DOE/NASA/0017-2; NAS 1.26:174720) Avail: NTIS HC A03/MF A01 CSCL 10B

Cost analysis of phosphoric acid fuel cell power plant includes two parts: a method for estimation of system capital costs, and an economic analysis which determines the levelized annual cost of operating the system used in the capital cost estimation. A FORTRAN computer has been developed for this cost analysis. Author

N84-34038*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

COGENERATION TECHNOLOGY ALTERNATIVES STUDY (CTAS). VOLUME 2: COMPARISON AND EVALUATION OF RESULTS

Aug. 1984 394 p refs

(Contract DE-AI01-77ET-13111)

(NASA-TM-81401; E-311; DOE/NASA/13111-14; NAS 1.15:81401) Avail: NTIS HC A17/MF A01 CSCL 10B

CTAS compared and evaluated various advanced energy conversion systems that can use coal or coal-derived fuels for industrial cogeneration applications. The principal aim of the study was to provide information needed by DOE to establish research and development (R&D) funding priorities for advanced-technology systems that could significantly advance the use of coal or coal-derived fuels in industrial cogeneration. Steam turbines, diesel engines, open-cycle gas turbines, combined cycles, closed-cycle gas turbines, Stirling engines, phosphoric acid fuel cells, molten carbonate fuel cells, and thermionics were studied with technology advancements appropriate for the 1985-2000 time period. The various advanced systems were compared and evaluated for a wide diversity of representative industrial plants on the basis of fuel energy savings, annual energy cost savings, emissions savings, and rate of return on investment (ROI) as compared with purchasing electricity from a utility and providing process heat with an on-site boiler. B.W.

N84-34039# California State Univ., Sacramento. Dept. of Physics.

PERFORMANCE OF PASSIVE SOLAR AND ENERGY CONSERVING HOUSES IN CALIFORNIA Final Subcontract Report

Sukhbir Mahajan, Charles Newcomb, Michael Shea, and Daniel Mort Nov. 1983 333 p refs

(Contract DE-AC02-83CH-10093)

(SERI/STR-254-2017) Avail: NTIS HC A15/MF A01

This report provides a technical description of the methodology and the results of a two year effort to collect field data on the performance of passive solar and energy conserving houses in California. Sixty-three passive solar houses were visited and several hours were spent with the homeowner obtaining building details, management procedures, architectural plans, photographs, and at least a year of billing data. With this information thermal performance parameters were calculated for each of the houses. Eleven of the above sixty-three Class C sites (nine passive solar and two energy conserving houses) were instrumented and monitored using the SERI Class B methodology as a guideline. Continuous data were collected for one year using up to 18 different sensors to measure temperatures, electric power, insolation, and the status of fans, gas burners, and moveable insulation. In addition careful one time measurements were made to determine the loss coefficient, infiltration rate, and furnace efficiency. Analysis of this data giving comfort conditions maintained and energy uses for a complete heating and cooling season for each of the houses is presented. B.W.

N84-34040# Oak Ridge National Lab., Tenn. Mathematics and Statistics Research Dept.

PCMSOL-1: A COMPUTER SIMULATION CODE FOR A DIRECT GAIN PASSIVE SOLAR STRUCTURE. PART 2: PCMSOL-1 USERS GUIDE

C. A. Serbin, G. A. Geist, A. D. Solomon, and J. J. Tomlinson Feb. 1984 178 p refs

(Contract W-7405-eng-26)

(ORNL/CSD-127/P-2) Avail: NTIS MF A01; print copy available

at WMO, Geneva

The simulation code PCMSOL-1 is for a one room direct gain passive solar structure which allows the incorporation of phase change materials and/or other high thermal mass materials in the walls, ceiling, or floor. To lessen the possibility of erroneous but realistic looking results through misuse of PCMSOL-1, a detailed description of the numbering conventions, the variable input and output parameters, their specification, and their limitations is presented. Also included is a program flow chart and a well-documented listing. Author

N84-34041# Department of the Army, Washington, D. C.
DISTRIBUTED PULSE FORMING NETWORK FOR MAGNETIC MODULATOR Patent Application
M. Weiner, J. L. Carter, and R. J. Youmans, inventors (to Army) Filed 10 May 1984 87 p
(AD-D011062; US-Patent-Appl-SN-608840) Avail: NTIS HC A05/MF A01 CSCL 10/2

A pulse forming network with distributed inductance and capacitance is disclosed for use in a magnetic modulator. The magnetic modulator has a magnetic core with a primary winding and a secondary winding around it. The pulse forming network includes an inner winding of flattened wire around the magnetic core and connected to one end of the secondary winding for receiving an induced voltage. The pulse forming network also includes a metal foil shield around the inner winding, so that the induced voltage may be stored capacitively between the inner winding and the shield. When the magnetic core saturates, the impedance of the secondary winding drops, so that the pulse forming network discharges through a load. The shape of the pulse through the load is determined by the inductance of the inner winding and the capacitance between the inner winding and the shield. The number of turns per unit length of the inner winding, the spacing between the inner winding and the shield, and the dielectric constant of an insulating layer of material between the inner winding and the shield may all be modified to obtain a pulse forming network forming a desired pulse shape.
Author (GRA)

N84-34042# Pacific Northwest Lab., Richland, Wash.
SEASONAL THERMAL ENERGY STORAGE
R. D. Allen, L. D. Kannberg, and J. R. Raymond May 1984 123 p refs
(Contract DE-AC06-76RL-01830)
(DE84-013854; PNL-5067) Avail: NTIS HC A06/MF A01

Seasonal thermal energy storage (STES) using heat or cold available from surplus, waste, climatic, or cogeneration sources show great promise to reduce peak demand, reduce electric utility load problems, and contribute to establishing favorable economics for district heating and cooling systems. Heated and chilled water can be injected, stored, and recovered from aquifers. Geologic materials are good thermal insulators, and potentially suitable aquifers are distributed throughout the United States. Potential energy sources for use in an aquifer thermal energy storage system include solar heat, power plant cogeneration, winter chill, and industrial waste heat source. Topics covered include: (1) the U.S. Department of Energy seasonal thermal energy storage program; (2) aquifer thermal energy storage technology; (3) alternative STES technology; (4) foreign studies in seasonal thermal energy storage; and (5) economic assessment. DOE

N84-34043# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
PRELIMINARY ASSESSMENT OF THE VELOCITY PUMP REACTION TURBINE AS A GEOTHERMAL TOTAL-FLOW EXPANDER
O. J. Demuth Jun. 1984 44 p refs
(Contract DE-AC07-76ID-01570)
(DE84-014749; EGG-GTH-6658) Avail: NTIS HC A03/MF A01

The velocity pump reaction turbine (VPRT) was evaluated as a total flow expander in a geothermal-electric conversion cycle. Values of geofluid effectiveness of VPRT systems were estimated for conditions consisting of: a 360(F) geothermal resource, 60 F wet-bulb ambient temperature, zero and 0.003 mass concentrations of dissolved noncondensible gas in the geofluid, 100 and 120 F condensing temperatures, and engine efficiencies ranging from 0.4 to 1.0. Achievable engine efficiencies were estimated to range from 0.77, with plant geofluid effectiveness values ranging as high as 9.5 watt hr-lbm geofluid for the 360 F resource temperature. This value is competitive with magnitudes of geofluid effectiveness projected for advanced binary plants, and is on the order of 40% higher than estimates for dual-flash steam and other total flow systems reviewed. Because of its potentially high performance and relative simplicity, the VPRT system appears to warrant further investigation toward its use in a well-head geothermal plant. DOE

N84-34044# GKSS-Forschungszentrum Geesthacht (West Germany). Zentralabteilung Technikum.
MEASURING AND DATA EVALUATION SYSTEMS AT THE WIND TEST SITE PELLWORM [MESSYSTEM UND DATENAUSWERTEMETHODIK DES VERSUCHSFELDES FUER WINDKRAFTANLAGEN PELLWORM]
S. Fries, G. Petersen, D. Borchers, H.-T. Mengelkamp, and H.-J. Tauffenbach 6 Apr. 1984 36 p refs In GERMAN; ENGLISH summary Presented at Seminar on Messtech. Untersuchungen an Windenergieanlagen, Juelich, West Germany, 4-5 Apr. 1984
(GKSS-84/E/12; ISSN-0344-9629) Avail: NTIS HC A03/MF A01

A test field for small wind energy converters is described. Power curves and efficiencies for rotor diameters of about 12 m and electrical output up to 25 kW were investigated. Data acquisition from five test areas is controlled by a central processing unit. Typical test results are presented. Author (ESA)

N84-34045# Maschinenfabrik Augsburg-Nuernberg A.G., Munich (West Germany).
SOLAR ENERGY. M.A.N. SYSTEMS AND THEIR EFFICIENCY [SOLARENERGIE - M. A. N. - SYSTEME UND IHRE WIRTSCHAFTLICHKEIT]
J. Siemer 1984 12 p In GERMAN Presented at Rahmen der Fachschau Energie auf der Hannover Messe 1984
Avail: NTIS HC A02/MF A01

Systems for the utilization of solar energy as thermal energy are presented. Solar systems to produce process heat are listed. Photothermal conversion of solar radiation by mirrors to obtain high temperature (140 to 250C) process heat whereby a heat transport medium (water, oil, gas) is heated is described. Solar farm concepts provide thermal powers up to a few MW. The Helioman 3/32 collector in Getafe (Spain), the Helioman 3/32 collector field of the IEA solar farm in Almeria (Spain), and the Helioman M480 prototype are outlined. Author (ESA)

N84-34046# Maschinenfabrik Augsburg-Nuernberg A.G., Munich (West Germany).
WIND ENERGY. M.A.N. SYSTEMS AND THEIR EFFICIENCY [WINDENERGIE - M. A. N. - SYSTEME UND IHRE WIRTSCHAFTLICHKEIT]
J. Siemer 1984 12 p In GERMAN Presented at Rahmen der Fachschau Energie auf der Hannover Messe 1984
Avail: NTIS HC A02/MF A01

The utilization of wind energy systems is discussed. Political and economic factors are analyzed. The Aeroman and WKA 100 (Growiar) systems are presented. In the Federal Republic of Germany, 2% to 20% of annual electricity consumption could be produced by wind energy, but production costs must be reduced. Author (ESA)

N84-34047# Maschinenfabrik Augsburg-Nuernberg A.G., Munich (West Germany).
INCREASE OF THE ELECTRIC POWER CHARACTERISTIC NUMBER IN INDUSTRIAL POWER STATIONS. ADAPTATION OF POWER-HEAT COUPLING (PHC) TO A NEW CONSUMPTION STRUCTURE [ERHOEHUNG DER STROMKENNZAHL IN INDUSTRIE-KRAFTWERKEN - ANPASSUNG DER KRAFT-WAERME-KOPPLUNG AN EINE NEUE VERBRAUCHS-STRUKTUR IN BETRIEB]

D. Richter 1984 24 p In GERMAN Presented at Rahmen der Fachschau Energie auf der Hannover Messe 1984
Avail: NTIS HC A02/MF A01

Measures to change the electric power characteristic to reduce electricity bills are presented. Energy saving measures resulting in lower heat requirements often lead to increased electric power consumption. The power-heat coupling installation has to be modified by aggregates with an extremely low ratio of thermal to electric power, i.e., an extremely high electric power characteristic number. Air preheating with low pressure vapor, water preheating with vapor and heat storage are described. Author (ESA)

N84-34048# Maschinenfabrik Augsburg-Nuernberg A.G., Munich (West Germany).
HOURLY VALUES OF ELECTRICITY AND HEAT CONSUMPTION AND ELECTRICITY SUPPLY CONDITIONS. FUNDAMENTALS OF BLOCK HEATING POWER STATION (BHPS) CONSTRUCTION [STUENDLICHE WERTE VON STROM- UND WAERMEBEDARF UND DIE STROMBEZUGSKONDITIONEN. GRUNDLAGEN DER BHKW-AUSLEGUNG]
A. Munt 1984 37 p In GERMAN Presented at Rahmen der Fachschau Energie auf der Hannover Messe 1984
Avail: NTIS HC A03/MF A01

The electricity-economical aspects of BHPS were studied in order to optimize the traditional, heat oriented construction. A cost analysis of the electricity supply conditions determines an optimal exploitation of a BHPS and a value for the maximum yearly saving. A consumption analysis provides hourly values of electricity and heat consumption. These analysis give a data base with which several BHPS-configurations are simulated.
Author (ESA)

N84-34049# Maschinenfabrik Augsburg-Nuernberg A.G., Munich (West Germany).
EFFICIENCY AND OPERATING EXPERIENCE OF BLOCK HEATING POWER STATIONS (BHPS) [WIRTSCHAFTLCHKEIT UND BETRIEBSERFAHRUNGEN VON BHKW-ANLAGEN]
A. Jost Mar. 1984 35 p In GERMAN Presented at Rahmen der Fachschau Energie auf der Hannover Messe 1984
Avail: NTIS HC A03/MF A01

The fundamentals of power-heat coupling, its energy-political significance, and the definition of BHPS are presented. Utilization domains for BHPS-systems are given. The construction of the system is depicted: control variables, dimensioning, combined use of BHPS-systems, control technique, installation, and connection. The degree of cost reduction of BHPS-systems is analyzed. The service requirements are explained. Author (ESA)

N84-34050# Boewe Maschinenfabrik G.m.b.H., Augsberg (West Germany). Bereich Technik Maschinenbau.
DEVELOPMENT OF A WIND ENERGY CONVERTER WITH SINGLE BLADE ROTOR Final Report, Jun. 1981
Karl Hipp Bonn Bundesministerium fuer Forschung und Technologie Jun. 1984 43 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-114; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 9

Wind energy converters with high tip speed ratio and a capacity of up to 50 kW in a 8.5 /msec wind speed were developed. Units with 12 m diameter rotors were tested. The concept of a cost favorable plant as a high speed engine with a supercritically running one blade rotor (soft bearing), gust balance out, automatic blade adjustment to ensure favorable starting qualities, proves to be a success. The single rectangular blade non-twisted with the profile NACA 23012/18 has no dynamic problems. The application of a centrifugal governor, i.e., vane like a Maxwell slat, operating only by rotation about a fixed hinge axis in order to attain adequate constant rotational speed of the plant, is not satisfactory.
Author (ESA)

N84-34051# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany). Bereich Neue Technologien.
DEVELOPMENT OF A PRODUCTION PROCESS FOR CENTRAL RECEIVER COATINGS Final Report, Jan. 1983
Werner Scherber and Bernhard Schroeder Bonn Bundesministerium fuer Forschung und Technologie Jun. 1984 129 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-124; ISSN-0340-7606) Avail: NTIS HC A07/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 27

Spectrally selective absorber coatings were developed for solar farm applications. Electroplating of textured coatings, and intermetallic reaction of surface layers were used. Characteristic optical valves are between 0.94 and 0.96 for the solar absorption degree, and between 0.14 and 0.17 for the heat emission degree. An unlimited lifetime at 400 C and short time stability up to 700 C are determined. The process is qualified under simulated series production conditions. Investigations on the intermetallic structure absorber reveal a promising preparation technique, which can lead to further applications such as low cost large area absorbers or absorbers for high temperature solar tower systems. Author (ESA)

N84-33669*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INERTIAL ENERGY STORAGE FOR SPACECRAFT
G. Ernest Rodriguez *In its* The 1983 Goddard Space Flight Center Battery Workshop Sep. 1984 p 3-22 refs (For primary document see N84-33668 23-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N84-34052# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
CHEMICAL ANALYSIS OF IONS IN RAIN WATER IN NATURAL REGIONS: CORRELATIONS WITH AEROSOLS IN THE ATMOSPHERE [ANALISE QUIMICA DE IONS EM AGUAS DE CHUVA DE REGIOES NATURAIS. CORRELACOES COM AEROSSOIS ATMOSFERICOS]
M. F. M. Tavares, B. M. Vieira, and L. M. Moreira-Nordemann Aug. 1983 28 p refs In PORTUGUESE Presented at the 5th Simposio Brasileiro de Hidrologia e Recursos Hidricos
(INPE-2856-PRE/395) Avail: NTIS HC A03/MF A01

The chemical composition of rain water and aerosol particles collected systematically between July 1981 and November 1982 at three meteorologic stations located in the eastern part of the state of Sao Paulo, Brazil was compared. The atmospheric concentrations of sodium, magnesium, potassium, calcium, and chlorine ions were analyzed, and total particle concentration was determined. The results were correlated with some geographic and meteorologic parameters. The greatest concentration of aerosol particles was found in Sao Jose dos Campos, a highly industrialized area. Based on the findings, inferences are made concerning continent-ocean-atmosphere interactions. An interdependent relationship between rain water composition and the concentration and quality of particulate material in atmospheric suspensions is proposed. Translated by B.G.

N84-34053# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
PRELIMINARY CHEMICAL ANALYSIS OF RAIN WATER IN CUBATAO: AMBIENT EFFECTS [ANALISE QUIMICA PRELIMINAR DAS AGUAS DE CHUVA DE CUBATAO - IMPACTOS ABIENTAIS]
L. M. Moreira-Nordemann, J. L. R. Bertoli, R. C. deA. Cunha, and C. R. Palombo Aug. 1983 13 p refs In PORTUGUESE Presented at the 5th Simposio Brasileiro de Hidrologia e Recursos Hidricos

(INPE-2857-PRE/396) Avail: NTIS HC A02/MF A01

Rain water samples collected at Cubatao Centro and Vila Parisi in Brazil were analyzed chemically. Concentrations of ions of sodium, calcium, potassium, magnesium, chlorine, sulfate, fluorine, ammonium, nitrite, nitrates, and also iron, zinc, lead, nickel, cadmium, mercury, and manganese in rain water samples at both locations were determined. The preliminary results are compared with other findings obtained by several authors for different world regions. The study results and aerosol composition measurements obtained for the Cubatao region were compared, and a correlation matrix was developed. Some soil sample analyses also were performed, including pH measurements; the low pH values indicate strong acidity in these samples. Translated by B.G.

N84-34054# Institute for Energy Analysis, Washington, D.C.
AN ANALYSIS OF POSSIBLE FUTURE ATMOSPHERIC RETENTION OF FOSSIL FUEL CO-2
J. A. Edmonds, J. Reilly, J. R. Trabalka (ORNL, Tenn.), and D. E. Reichle (ORNL, Tenn.) Sep. 1984 169 p refs
(Contract DE-AC05-84OR-21400)
(DOE/OR-21400/1; TRO13) Avail: NTIS HC A08/MF A01

The likely rates and the potential range of future CO2 emissions are combined with knowledge of the global cycle of carbon, to estimate a possible range of atmospheric CO2 concentrations through the year 2075. Historic fossil fuel usage to the present was combined with three scenarios of projected emissions growth ranging from approximately 0.2% to 2.8% per year to provide annual CO2 emissions data for two different carbon cycle models. The emissions scenarios were constructed using an energy-economic model and by varying key parameters within the bounds of currently expected future values. Carbon cycle model simulations yield a range of possible atmospheric CO2 concentrations in year 2075 of approximately 5000 to 1500 ppm, with a median of about 700 ppm. A.R.H.

N84-34055# Oak Ridge National Lab., Tenn.
COMPUTER IMPLEMENTATION OF A GLOBALLY AVERAGED MODEL OF THE WORLD CARBON CYCLE
William R. Emanual, George G. Killough, Wilfred M. Post, Herman H. Shugart, and Mary P. Stevenson (Science Applications, Inc., Oak Ridge, Tenn.) Jul. 1984 88 p refs
(Contract DE-AC05-84OR-21400)
(DOE/NBB-0062; TRO10) Avail: NTIS HC A05/MF A01

A model of the global carbon cycle and its computer implementation are described. The dynamics of total carbon and the two less abundant isotopes, C-13 and C-14, are treated. The model equations are derived from a compartment diagram of the cycle by expressing mass balance for each compartment as a first-order differential equation. The atmosphere is represented by a single compartment and the oceans by 19 globally averaged layers with depth. Carbon in terrestrial ecosystems is divided among five compartments. The model simulates phenomena on time scales from several years to several centuries. Carbon dioxide released to the atmosphere by fossil fuel combustion and C-14 produced naturally in the atmosphere or by nuclear weapons tests are incorporated as exogenous inputs. Forest clearing results in a direct transfer of carbon to the atmosphere from tree compartments as well as a transfer to detritus/decomposers. The relative magnitudes of fluxes from the atmosphere to trees and ground vegetation are altered as a result of land use change. The model, implemented in FORTRAN, uses readily available routines for standard numerical procedures. Exogenous data sets are not accessed. Parameter values and control variables are set in data initialization statements. Tabulated results are provided as printed output. A.R.H.

N84-34056# Pacific Northwest Lab., Richland, Wash.
HISTORICAL CARBON DIOXIDE: ABUNDANCES DERIVED FROM THE SMITHSONIAN SPECTROBOLOGRAMS
Gerald M. Stokes, James C. Barnard, and Erik W. Pearson Aug. 1984 122 p refs
(Contract DE-AC06-76RL-01830)
(DOE/NBB-0063; TR-11) Avail: NTIS MF A01; print copy available at WMO, Geneva

A representative sample of Smithsonian spectrobolograms were analyzed for 1935, 1941, and 1948. The resulting carbon dioxide concentrations for those years are 297.7 plus or minus 5.6, 298.4 plus or minus 6.3, and 308.3 plus or minus 4.6 ppm, respectively. There may be an additional 2 to 3 ppm systematic error in this result because of remaining uncertainties in absolute band strengths and the precise relationship between integrated column density and surface density measurements. These results also yield an annual increase of 0.59 plus or minus .27 ppm for the average trend for the period of 1935 through 1948. The method of analysis used to obtain these results is described in detail. Additional critical issues addressed include: the relationship between the integrated column density of atmospheric carbon dioxide and surface measurements of the CO2 concentration; the possible sources of systematic and random error in the data; and the precision and accuracy of the results. R.J.F.

N84-34057# Department of the Air Force, Washington, D.C.
PORTABLE, SEQUENTIAL AIR SAMPLER Patent Application
J. P. Conkle, inventor (to Air Force) Filed 25 Apr. 1984 29 p
(AD-D011169; US-Patent-Appl-SN-603528) Avail: NTIS HC A03/MF A01 CSCL 13/2

A portable, sequential air sampler is described having an easily transportable housing containing therein a plurality of interrelated components which allow the air sampler to operate by either battery or line power as well as maintain the flow rate through the sampling media substantially constant. The components include a vacuum pump and rotary valve which are capable of sequentially drawing air through the sampling media. In addition, a flow rate control system is operably connected to the vacuum pump in order to maintain the substantially constant flow rate through the sampling media. The air sampler can vary initiation of the sampling operation from 1-99 minutes while varying the sequence of sampling from 1-99 minutes, and yet, maintain substantially constant air flow throughout the air sampling procedure. Author (GRA)

N84-34058# Bragerwerke A.G., Luebeck (West Germany). Grundlagenentwicklung.
QUANTITATIVE DETERMINATION OF GASEOUS AIR POLLUTANTS BY SEMICONDUCTING SENSORS Final Report, Apr. 1981
Rainer Lambrich and Manfred Sondergeld Bonn Bundesministerium fuer Forschung und Technologie Jun. 1984 90 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-113; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 19

Metal oxide semiconductors for the detection of gaseous air pollutants were investigated. Sinter bodies, sinter films and sputter films of ZnO and SnO2 were systematically investigated to detect carbon monoxide (CO), methane (CH4) and hydrogen (H2S) quantitatively and selectively. Sensitivity, selectivity and long term stability are considerably improved by dopants, catalysts and stabilizing admixtures. Short rise times for quick alarm devices are accomplished by specific preparation techniques. Based on the investigations a measuring and alarm apparatus for H2S was developed. A procedure to reduce the cross sensitivity and the aging effects of the CO/CH4 sensor is described. Author (ESA)

N84-33965*# GKSS-Forschungszentrum Geesthacht (West Germany).
HYDROGEN CHLORIDE MEASUREMENTS WITH A DIFFERENTIAL ABSORPTION AND SCATTERING (DAS) LIDAR IN THE MARINE ATMOSPHERE [INST. FUER PHYSIK.]
H.-J. Heinrich, C. Weitkamp, and W. Michaelis *In* ESA AGARSS 84: Remote Sensing: From Res. towards Operational Use, Vol. 2 Aug. 1984 p 679-684 refs (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 13B

N84-33966*# GKSS-Forschungszentrum Geesthacht (West Germany). Inst fuer Physik.
STATE-OF-THE ART DIFFERENTIAL ABSORPTION AND SCATTERING (DAS) LIDAR FOR SO2 AND NO2
W. Lahmann, W. Staehr, C. Weitkamp, and W. Michaelis *In* ESA IGARSS 84: Remote Sensing: From Res. towards Operational Use, Vol. 2 Aug. 1984 p 685-688 refs (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 13B

N84-33967*# Deutscher Wetterdienst, Hamburg (West Germany).
LIDAR OBSERVATIONS OF THE PLUMES OF INCINERATION SHIPS
K. Klapheck *In* ESA IGARSS 84: Remote Sensing: From Res. towards Operational Use, Vol. 2 Aug. 1984 p 689-693 refs (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 13B

N84-33969*# Joint Research Centre of the European Communities, Ispra (Italy).
REMOTE MONITORING OF SEDIMENTS AND CHLOROPHYLL AS TRACES OF POLLUTANT MOVEMENTS IN A MEDITERRANEAN COASTAL AREA
G. M. Ferrari, S. R. GallideParatesi, G. Maracci, M. Ooms, P. 06Sturm Schlittenahrdt, B., and S. Tassan *In* ESA IGARSS 84: Remote Sensing: From Res. towards Operational Use, Vol. 2 Aug. 1984 p 701-707 refs (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF CSCL 13B

N84-33971*# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Wesseling (West Germany).
THE MODIFICATION OF THE MODULATION TRANSFER FUNCTION BY SEA SLICKS MEASURED BY L-BAND RADAR
H. Huehnerfuss (Institut fuer Organische Chemie, Hamburg), P. Lange (Bundesanstalt fuer Wasserbau, Hamburg), F. Schlude, and B. Schlittenahrdt, and S. Tassan *In* ESA IGARSS 84: Remote Sensing: From Res. towards Operational Use, Vol. 2 Aug. 1984 p 715-719 refs Sponsored by Deutshce Forschungsgemeinschaft and Navy (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 13B

N84-33972*# University of Petroleum and Minerals, Dhahran (Saudi Arabia).
DETECTION AND MONITORING OF THE 1983 NOWRUZ OIL SPILL USING AVHRR DATA
Marwan J. Muasher and Fuat Ince *In* ESA IGARSS 84 Remote Sensing: From Res. Towards Operational Use, Vol. 2 Aug. 1984 p 721-728 refs (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 13B

N84-33973*# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Wesseling (West Germany).
OIL SPILL DETECTION WITH DFVLR X-BAND SLAR
H. Nithack and F. Witte *In* ESA IGARSS 84 Remote Sensing: From Res. Towards Operational Use, Vol. 2 Aug. 1984 p 729-733 (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 13B

N84-33974*# Conoco, Inc., Ponca City, Okla.
AN ACTIVE REMOTE SENSING SYSTEM TO MAP LOCATION OF UNDERWATER OIL SEEPS
A. C. Correa, A. J. Blanchard (Texas University, Arlington), and J. S. Gergely *In* ESA IGARSS 84 Remote Sensing: From Res. Towards Operational Use, Vol. 2 Aug. 1984 p 735-740 refs (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 13B

N84-33975*# Technical Univ. of Denmark, Lyngby.
MICROWAVE RADIOMETRY FOR OIL POLLUTION MONITORING, MEASUREMENT AND SYSTEMS
N. Skou *In* ESA IGARSS 84 Remote Sensing: From Res. Towards Operational Use, Vol. 2 Aug. 1984 p 741-747 refs Original contains color illustrations (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 13B

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation.*

N84-34059 Polish Academy of Sciences, Warsaw.
SOLUTIONS OF NONLINEAR EQUATIONS OF MAGNETO-IONIC THEORY [ROZWIAZANIA NIELINIOWYCH ROWNAN TEORII MAGNETOJONOWEJ]
W. Laprus 1983 20 p In POLISH
(ISSN-0208-5688) Copyright. Avail: Issuing Activity

Asymptotic solutions are provided for equations from magneto-ionic theory, which describe the propagation of electromagnetic waves in the ionosphere. The equations are based on a simple reaction model of an electric field with plasma composed of movable electrons and fixed ions. The equations form a disperse system with large parameter proportional to an element with average electron density. The described model is inadequate for large electric fields. The methods of progressive waves for quasi-linear dispersive equations described by Laprus are employed. Author

N84-34060 Texas Univ., Austin.
ANALYSIS OF LARAMIDE AND YOUNGER DEFORMATION OF A SEGMENT OF THE BIG BEND REGION, TEXAS Ph.D. Thesis
Adel Ramadan Moustafa 1983 278 p
Avail: Univ. Microfilms Order No. DA8414419

Field mapping of the Sierra Del Carmen, Big Bend National Park, and Black Gap Wildlife Management Area shows that the macrostructures in the exposed Cretaceous and younger rocks are persistent zones of west-northwest-oriented strike-slip faults, north-northwest-oriented monoclines, and north-northwest-oriented normal faults. The west-northwest-oriented left-stepped en echelon faults occur in zones about 5.5 km apart. The monoclines decrease in structural relief toward and are bounded by these fault zones. The Laramide compression caused left-lateral convergent wrenching which formed the north-northwest-oriented monoclines, west-northwest-oriented hinge, and a few west-northwest-oriented left-lateral strike-slip faults. Right-lateral divergent wrenching along the west-northwest-oriented faults due to basin-and-range extension formed pull-apart grabens. The west-northwest-oriented fault zones are Laramide and basin-and-range rejuvenation of pre-existing faults. LANDSAT images show a set of right-stepped, en echelon west-northwest-oriented lineament zones in the Trans-Pecos area. Dissert. Abstr.

N84-34061 Virginia Polytechnic Inst. and State Univ., Blacksburg.
BROKEN-FORMATIONS OF THE PULASKI THRUST SHEET NEAR PULASKI, VIRGINIA Ph.D. Thesis
Arthur Philip Schultz 1983 111 p
Avail: Univ. Microfilms Order No. DA84112948

Broken-formations occur in the lower part of the Pulaski thrust sheet and contain some of the most strongly deformed sedimentary rocks in the valley and ridge province of the southern Appalachians. Deformation in this zone ranges from grain-scale cataclasis to regional-scale faulting. The broken formations are distinguished from rocks structurally higher on the sheet and from rocks of the underlying Saltville sheet by: (1) a sharp increase in the variability of fold and fault styles; (2) greater ranges in fold plunges and dips of axial surfaces; (3) a low degree of preferred orientation of folds and faults; (4) an increase in the frequency of mesoscopic structures; and (5) the presence of Max Meadows tectonic breccia. Structural analyses indicate that deformation in the broken-formations is Alleghanian in age and that the deformed zone formed

under elastic-frictional conditions, possibly under elevated fluid pressures with temporally variant stresses and that lithology possibly played an important role in localizing the broken-formations along the base of the Pulaski sheet. Dissert. Abstr.

N84-34062 Stanford Univ., Calif.
THE HALL (NEVADA MOLY) MOLYBDENUM DEPOSIT, NYE COUNTY, NEVADA: GEOLOGY, ALTERATION, MINERALIZATION AND GEOCHEMICAL DISPERSION Ph.D. Thesis
Stephen Allen Shaver 1984 560 p
Avail: Univ. Microfilms Order No. DA8412882

At Hall, each of two molybdenum bearing, quartz monzonite porphyry stocks underwent continuous inward crystallization which was interrupted by the successively deeper release of hydrothermal fluids to form a concentrically zoned stock, three stacked orebodies, and overlapping zones of alteration mineralization. Each pulse progressed in time from albitic to potassic to greisen alteration, with later veins closing the pulse. Based on fluid inclusions, early (potassic) veins formed from high temperature, moderate salinity, nonboiling fluids under lithostatic pressure; later (base metal) veins formed from lower temperature, high salinity, probably boiling fluids under hydrostatic pressure. Differences between quartz monzonite type and climax type porphyry molybdenum deposits in geology, alteration, mineralization, and geochemical dispersion are consistent with greater depths of emplacement of the quartz monzonite type deposits. Dissert. Abstr.

N84-34063 Stanford Univ., Calif.
THE SHEAR WAVE VELOCITY STRUCTURE OF THE LITHOSPHERE IN CENTRAL AND NORTHERN CALIFORNIA Ph.D. Thesis
Alan R. Levander 1984 237 p
Avail: Univ. Microfilms Order No. DA8412866

Three component seismographs deployed in arrays to record both local and teleseismic earthquakes were studied. Travel-time analysis of local earthquake shear waves in the Diablo Range and Napa region provided average crustal shear velocity structures for the two regions. Fundamental mode Rayleigh wave phase velocities in the period band 16-45 seconds were measured along three parallel paths in the Coast Ranges and Great Valley east of the San Andreas fault. To study the effects of lateral velocity variations on dispersion, Rayleigh wave propagation in laterally varying structures were simulated numerically using finite difference techniques. Analysis of several models demonstrates that phase velocities measured over a gradually varying velocity structure are representative of the average plane layered structure beneath the measuring array. The results of the numerical modeling suggest that the plane-layered interpretations made from the Rayleigh wave observations in California represent the average elastic properties of the lithosphere. Dissert. Abstr.

N84-34064 Stanford Univ., Calif.
APPLICATIONS OF TELESEISMIC BODY WAVES TO SHALLOW EARTH STRUCTURE Ph.D. Thesis
Joseph Paul Stefani 1984 144 p
Avail: Univ. Microfilms Order No. DA8412886

First motion body wave data are compared with synthetic seismograms, derived both from ray theory and the Thomson-Haskell propagator matrix method, to determine both the spatial extent and qualitative nature of several seismic structures in the Earth's crust and upper mantle. S wave anisotropy is modeled to determine its effects on the onset times of direct S arrivals. A seismic phase from an event in the Kurils is interpreted to be a reflection from the slab asthenosphere boundary, which indicates that the zone of seismic failure within the slab extends at least 40 km from the effective upper seismic boundary of the slab. Seismicity in the thrust zones of the slab subducting beneath the Kuril Islands is studied in order to establish a spatial relationship among the various thrust zones. Increased resistance from the overriding plate, together with a possible bend in the subducting plate, is responsible for the nucleation of all the large thrust events in that region. The structure of the lower crust and asthenosphere in the fossil subduction zone in coastal central California is investigated. Shear wave anisotropy to the west of the San Andreas fault zone in central California suggests that the asthenosphere is ductile enough to respond to forced velocity changes. Dissert. Abstr.

N84-34065 California Univ., Berkeley.
CIRQUES OF THE MARBLE MOUNTAINS, NORTHWESTERN CALIFORNIA Ph.D. Thesis
Richard William Harms 1983 199 p
Avail: Univ. Microfilms Order No. DA8413420

This study attempts to overcome the problem of a lack of standardization in nomenclature and methodology in cirque studies. A total of 177 cirques were identified, and standardized methods were employed to determine cirque altitude and aspect. A new technique was utilized to specify cirque area. Patterns were revealed that are consistent with those found in other mid-latitude maritime mountain systems. A steep inland rise in cirque elevation was found, and a strongly asymmetric cirque aspect mean toward the north-northeast was defined. Significant variations in cirque area occur with changes in altitude (larger cirques at lower altitudes), orientation (larger cirques in north-facing sites), and proximity to the coast (larger cirques closer to the coastline). Polynomial trend surface analysis of cirque elevation in the Marble Mountains approximated the composite Pleistocene snowline and provided statistics on the relative strengths of regional climatic influences versus local factors in determining the altitude of cirque development. Dissert. Abstr.

N84-34066 Cincinnati Univ., Ohio.
FORMS OF LARGE FOLDS IN THE CENTRAL APPALACHIANS, PENNSYLVANIA Ph.D. Thesis
Aytuna Sezgin 1984 248 p
Avail: Univ. Microfilms Order No. DA8413690

The forms of 1st order and 2nd order folds in the central Appalachians of Pennsylvania were studied. The current prevailing interpretation is that the 1st and 2nd order folds are kink bands or conjugate kink bands. The folds are complicated, but they resemble combinations of chevron like and concentric like forms. The folding theory is applied to complex multilayers, composed of layers of different rheological properties, including the interaction caused by the simultaneous growth of folds with two different wavelengths, in order to study the origin of fold forms in the central Appalachians. An idealized stratigraphic section for rocks in the central Appalachians is divided into structural units with different viscosities and thicknesses based upon study of lithologic descriptions. A detailed field study of the Shikellamy fold, a 3rd order fold near Northumberland, Pennsylvania is presented. The Shikellamy fold is the largest kink line fold known in the central Appalachians. The field evidence suggests that the Shikellamy fold is a monocinal kink fold, but it is unclear how the fold formed. Dissert. Abstr.

N84-34067 Syracuse Univ., N. Y.
DEFORMATION OF THE SUBSURFACE SILURIAN AND DEVONIAN ROCKS OF THE SOUTHERN TIER OF NEW YORK STATE Ph.D. Thesis
Katherine Jorgensen Beinkafner 1983 481 p
Avail: Univ. Microfilms Order No. DA8410703

Seismic, lithofacies, and structural interpretations are integrated into a tectonic model. For the Middle Ordovician to Middle Devonian interval, subsurface lithofacies are mapped from well sample logs. The elusive decollement of the Allegheny Plateau is identified and mapped from repeat sections on gamma ray logs. In the eastern counties, Unit F (salt) sections of the Syracuse Formation are vertically repeated two and three times along splays originating at decollement. The dome shape of the top of the Syracuse Formation and a planar base suggest a thin-skinned tectonic origin. In Steuben and Allegheny Counties, Unit E sections are overthickened and the detachment surface is near the base of Unit E. In Chautauqua County decollement terminates in a structure with northeast strike. At the northwest edge of the underlying salt beds, horizontal decollement bends upward forming structural petroleum traps. A decollement tectonic model for the southern tier is proposed in

which individual buried fault blocks display differential movement above detachment zones. Dissert. Abstr.

N84-34068 Texas Univ., Austin.
DEPOSITIONAL HISTORY AND SEDIMENTOLOGY OF UPPER CRETACEOUS MANCOS SHALE AND LOWER MESAVERDE GROUP, NORTHWESTERN COLORADO: MIGRATING SHELF-BAR AND WAVE-DOMINATED SHORELINE DEPOSITS Ph.D. Thesis
Joseph Michael Boyles 1983 321 p
Avail: Univ. Microfilms Order No. DA8414348

The Mesaverde Group in northwestern Colorado is a thick clastic wedge that prograded eastward into and over the Mancos Shale. Models of the depositional systems were constructed through study of rock textures and physical and biogenic structures. The geometry of lithofacies was determined from outcrops. Lithofacies geometry and relations combined with inferred processes from sedimentary structures were used to develop depositional models. Shelf sandstones were deposited by migrating submarine shelf bars that are now encased in marine mudstones of Mancos Shale. Two major processes were active during deposition: (1) fairweather southwesterly currents, and (2) storm erosion and westerly sediment transport. During fair weather, sandwaves migrated along the bar crest and the back bar was bioturbated. Storms eroded the seaward face and crest of the bar and transported sediment into the back bar area. The Mesaverde Group is able to be subdivided into wave dominated deltaic deposits and flanking rich strand plain, interdeltaic deposits. Dissert. Abstr.

N84-34069 Rhode Island Univ., Kingston.
EOLIAN QUARTZ GRANULOMETRY AS A PALEOWIND INDICATOR IN THE NORTHEAST EQUATORIAL ATLANTIC, NORTH PACIFIC AND SOUTHEAST EQUATORIAL PACIFIC Ph.D. Thesis
Joseph Paul Dauphin 1983 355 p
Avail: Univ. Microfilms Order No. DA8414880

Northeast Atlantic - Grain size analysis of the quartz silt fraction defines the spatial and temporal variability of windblown Saharan dust. Comparison of an eolian transport model for Saharan dust (Parkin, 1974) with the quartz grain size data shows general agreement between predicted and observed values. Central North Pacific - Quartz in deep-sea sediments of the North Pacific is derived from Asia by eolian transport in the westerlies. The average mean mass diameter of the silt-size quartz decreases from about 10um at 150 degrees E to 7um at 140 degrees W. Southeast Pacific - Quartz from South America is the dominant source to the southeast Pacific. A northern source is evident near the equator (RC10-65; 0 degrees 41 minutes N, 108 degrees 37 minutes W). This source was most prominent during interglacial stage 5, suggesting enhanced dust production in Central America. During glacial periods the impact of bottom transport increased at the site of core V19-29 (3 degrees 35 minutes S, 83 degrees 56 minutes W). Dissert. Abstr.

N84-34070 Texas Univ., Austin.
PALEOGEOGRAPHY AND TECTONICS OF THE REDDING SECTION, EASTERN KLAMATH BELT, NORTHERN CALIFORNIA Ph.D. Thesis
Stuart William Fagin 1983 224 p
Avail: Univ. Microfilms Order No. DA8414365

A study of the broad structural framework of the Redding Section (RS) of the Eastern Klamath Belt (EKB) was undertaken in order to gain insight into the paleographic relationship of the Klamath Mountains (KM) to the Sierra Nevada Mountains (SN). Lines of research included: (1) an examination of the basal contact of the RS; (2) modeling of the Bouguer gravity pattern observed over the EKB; and (3) a paleomagnetic study of the RS. The principal findings of these analyses are as follows. (1) Paleomagnetic data indicate that the KM have rotated clockwise approximately 80 deg with respect to cratonic North America. Latitudinal displacements greater than 10 deg have not occurred. The structural mechanism which affected these rotations incorporates left-lateral movements along northwest-trending, antithetic faults which separate the Coastal and Central Franciscan Belts. (2) The RS structure consists of a flat western segment and an eastward-dipping eastern segment. The hinge zone between the two is a northeasterly trending structure which also forms the upturned western edge of the Great Valley. (3) The observed gravity pattern over the EKB is the predictable response to this structure and the broader EKB structure. Dissert. Abstr.

N84-34071 Texas Univ., Austin.
GEOMORPHOLOGY AND HYDROGEOLOGY OF THE EDWARDS PLATEAU KARST, CENTRAL TEXAS Ph.D. Thesis
Ernst H. Kastning, Jr. 1983 714 p
Avail: Univ. Microfilms Order No. DA8414393

The Edwards Plateau is one of the largest continuous karst regions of the United States; yet, its geomorphic evolution has previously received little systematic study. The overall objectives of this investigation are to: (1) describe the physical characteristics of karst features, (2) determine which geomorphic and hydrogeologic controls and processes have governed their development, and (3) relate genesis of karst spatially and chronologically to the geomorphic evolution of the Edwards Plateau. Cavern development provides a record of evolution of karst and the development of major carbonate aquifers of the region. Some control on cavern development are region-wide; nevertheless, many caves exhibit characteristics that suggest a strong influence of local factors. Development of cave chambers and passages has responded to the lithic character of bedrocks. Solution conduits were guided by variations in calcite and dolomite content, thickness of strata, and frequency of bedding-plane partings. This is particularly true of the Glen Rose Formation, limestone beds of the Edwards Group, and the Gorman Formation, the three principal cave-forming units. Dissert. Abstr.

N84-34072 California Univ., Los Angeles.
LOW AND HIGH ALTITUDE IONOSPHERIC MODIFICATION EXPERIMENTS Ph.D. Thesis
Joseph Santoru 1984 197 p
Avail: Univ. Microfilms Order No. DA8413678

High power, high frequency radio waves were transmitted into the ionosphere where a wide range of perturbation was generated. When two em pump waves are transmitted, the frequencies and amplitudes of the electrostatic waves depend critically on the frequency separation of the two pumps. The high latitude ionosphere is of interest because it is within the auroral zone and since the magnitude dip is 76.5 deg, the HF beam is easily tilted along the Earth's magnetic field. Diagnostic techniques, which involve the measurement of the ionospherically-reflected sky wave signals, were developed and were used to study fast time scale, transient effects which are prevalent at this latitude. If two short em pulses are used, it is possible to determine that the gentle ionospheric density profile contains short scale density inhomogeneities. By monitoring the sky wave return, it was possible to determine when either scattering or absorption was the dominant mechanism in determining the strength of the sky waves. Dissert. Abstr.

N84-34073# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
BARREIRA DO INFERNO: FIVE YEARS OF OZONE RESEARCH [BARREIRA DO INFERNO: 5 ANOS DE PESQUISA COM OZONIO]
V. W. J. H. Kirchhoff, A. G. Motta, and S. O. Azambuja Dec. 1983 16 p refs In PORTUGUESE Sponsored in part by Fundo Nacional de Desenvolvimento Cientifico e Tecnologico (FNDCT) (INPE-2974-PRE/437) Avail: NTIS HC A02/MF A01

A five-year tropospheric ozone research project carried out from 1978 to 1983 under the aegis of the Institute of Space Research and the Launching Center at Barreira do Inferno is described. The principal means of obtaining data was by sondes launched twice a month from November 1978 until mid-1981. Measurements were made by ECC sondes and by Loki, Super-Loki, and Super-Arcas rockets equipped with optical and fluorescent sounding devices. The interest in ozone research is based on the

ability of ozone to absorb ultraviolet radiation and thereby affect stratospheric temperature. Results revealed that average ozone concentration over the Brazilian state of Natal was 0.025 ppm (parts per million) with the maximum concentration occurring at 28 km altitude. It was also found that there was 30 percent higher ozone density over Natal than over regions of lower latitudes. In addition, 15 percent more ozone layer density was measured over Natal than over equatorial areas as determined by satellites. Total ozone measured by ECC sondes and by two Dobson spectrophotometers differed only by 4 percent. Higher concentrations of ozone are attributed to nitrogen concentrations, in contradiction with prevailing views. It is concluded that continued monitoring of ozone density is important for further theoretical investigation of the aeronomy of ozone. Transl. by B.G.

N84-34074*# National Aeronautics and Space Administration, Washington, D. C.
STUDY OF THE SYSTEM OF MIDDLE ATMOSPHERE-IONOSPHERE USING REMOTE-SENSING DATA
H. Hass, A. Ebel, G. K. Hartmann, and R. Leitinger Feb. 1984 14 p refs Transl. into ENGLISH from Kleinheubacher Berichte (Darmstadt), v. 25, 1982 p 203-210 Original language doc. was announced as A82-30966 Transl. by Scientific Translation Services, Santa Barbara, Calif. Original doc. prep. by Cologne Univ.
(NASA-TM-77764; NAS 1.15:77764) Avail: NTIS HC A02/MF A01 CSCL 04A

In the present investigation, the methods of statistical spectral analysis are employed for a study of the quasi-periodic changes of state parameters of the middle atmosphere and the ionosphere, taking into account oscillations with periods of several days. The considered oscillations are typical for planetary waves. The theory and empirical findings regarding transient planetary waves are utilized as a basis for the concepts employed in the data analysis and for the interpretation of the results. The results of the investigation show a presence of coherent variations in the time series of radiation density measurements and other state parameters for the middle atmosphere and the ionosphere. The existence of presumably dynamic coupling processes can be recognized in oscillations with periods of about 16 or 5 days. G.R. (IAA)

N84-34075# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
DEVELOPMENT OF AN AUTOMATIC SYSTEM FOR THE TREATMENT OF MAGNETOTELLURIC DATA M.S. Thesis [DESENVOLVIMENTO DE UM SISTEMA AUTOMATICO DE TRATAMENTO DE DADOS MAGNETOTELURICOS]
Luiz Sergio Vieira Dutra Jul. 1984 173 p refs In PORTUGUESE; ENGLISH summary
(INPE-3165-TDL/171) Avail: NTIS HC A08/MF A01

The magnetotelluric method (MT) is a technique used to determine the conductivity distribution of the Earth interior through surface measurements of changes in the electric and magnetic natural fields. An MT system consists of: sensors, analog filters, amplifiers, analog-digital conversion circuits and a data processing computer. The main goal is the proposal and partial implementation of an MT system to be assembled at INPE's laboratories. The sensors and the analog circuitry will be built, while the data acquisition and data analysis subsystems will have their operational specifications described. Author

N84-34076# Bureau of Mineral Resources, Geology and Geophysics, Canberra (Australia). Dept. of Resources and Energy.
GUIDE TO THE GEOLOGY OF AUSTRALIA
W. D. Palfreyman and J. S. Adkins, ed. 1984 115 p refs
(BMR-Bull-181; ISSN-0084-7089; ISBN-0-644-02808-4) Avail: NTIS HC A06/MF A01

The geology of onshore continental Australia is presented as a series of data sheets in which each geological province or entity is described in terms of key geological parameters: age, size, margins, physiography, elements, stratigraphy, igneous activity, metamorphism, deformation, and economic geology. An outline is given of Australian landforms, and a short geological history is presented. The bulletin is designed as a reference to the geology of Australia and as a companion to regional and continent-wide geological maps. Author

N84-34077# Bureau of Mineral Resources, Geology and Geophysics, Canberra (Australia). Dept. of Resources and Energy.
OLIGOCENE AND MIOCENE LARGER FORAMINIFERIDA FROM AUSTRALIA AND NEW ZEALAND
George C. H. Chaproniere 1984 156 p refs
(BMR-Bull-188) Avail: NTIS HC A08/MF A01

The lithostratigraphy, biostratigraphy and the systematics of larger foraminiferids at several Late Oligocene to Middle Miocene localities in Australia are described. In particular, sediments of this interval in the North West Cape area of the Carnarvon Basin, Western Australia, yielded diverse faunas of larger and planktic foraminiferids. Areas in New Zealand were also sampled and studied. Forty species and subspecies, representing 25 genera or subgenera of larger foraminiferids, were recorded. Wherever possible, biometric methods have been used to discriminate between taxa. Such studies suggest that the rates of evolution of some groups of larger foraminiferids in New Zealand were different from those in the Australian region. Among the taxa that are illustrated and described in detail are two subspecies of Lepidocyclina (Nephrolepidina) proposed as new: Lepidocyclina (Nephrolepidina) howchini praehowchini and Lepidocyclina (Nephrolepidina) orakeiensis waikukuensis. Topotypes of L. (N.) orakeiensis hornibrooki and L. (N.) howchini howchini are discussed and figured. Author

N84-34078# Bureau of Mineral Resources, Geology and Geophysics, Canberra (Australia). Dept. of Resources and Energy.
TERTIARY FORAMINIFERA AND AGE OF SEDIMENTS, OK TEDI-WABAG, PAPUA NEW GUINEA
D. J. Belford 1984 138 p refs
(BMR-Bull-216) Avail: NTIS HC A07/MF A01

Tertiary foraminifera ranging in age from Early Paleocene to Pliocene from the area covered by the Ok Tedi and Wabag 1:250,000 Sheets, Papua New Guinea, are recorded and illustrated. An annotated check list of planktonic foraminifera is given. The faunal sequence in all available sampled sections is discussed and applied to determining ages of the sediments. In some sections, associations of larger and planktonic foraminifera suggest that the presently accepted correlation of the Te/Tf boundary of the letter classification with the N.8/N.9 boundary of the planktonic foraminiferal zonal scheme requires revision. The Te/Tf boundary needs to be lowered in relation to the planktonic scale, possibly to within the N.6-N.7 zonal interval. Six new taxa are described: Globorotalia (Clavatorella) prolata, G. (Fohsella) peripheroacuta pristina, G. (F.) wabagensis, G. (G.) quasimiocenica, G. (Hirsutella) scitula planaria, and G. (Turborotalia) variospira. Author

N84-34079# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
INTRODUCTION TO ATMOSPHERIC GEOPHYSICS [INTRODUCAO A GEOFISICA DA ATMOSFERA]
I. J. Kantor Jul. 1984 17 p refs In PORTUGUESE; ENGLISH summary Presented at the 36th Reuniao Anual da SBPC, Sao Paulo, Brazil, 4-11 Jul. 1984
(INPE-3169-PRE/539) Avail: NTIS HC A02/MF A01

Basic concepts of Atmospheric Geophysics are presented with emphasis on the following subjects: The Sun's influence on the Earth's atmosphere; magnetosphere; ionosphere and radio wave propagation; upper, middle and low atmosphere, and the ozone layer. A description of the research in Atmospheric Geophysics being developed in Brazil is presented and its importance is discussed. Author

N84-34080# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
THE VARIATION OF RANGE TYPE SPREAD F OCCURRENCE WITH A SOLAR CYCLE AT FORTALEZA AND CACHOEIRA PAULISTA [VARICAO DA OCORRENCIA DA CAMADA F ESPALHADA COM O CICLO SOLAR EM FORTALEZA E CACHOEIRA PAULISTA]

M. A. Abdu, I. S. Batista, J. H. A. Sobral, and O. R. Nelson Jul. 1984 12 p refs In PORTUGUESE; ENGLISH summary Presented at the 36th Reuniao Anual da SBPC, Sao Paulo, Brazil, Jul. 1984 (INPE-3209-PRE/566) Avail: NTIS HC A02/MF A01

Range type spread F occurrence rates over Fortaleza (3.9 S; 38.6 W; dip: 3.5 S) and Cachoeira Paulista (22 deg 42'S; 45 W; dip: 26 S) during the equinoctial month of October were analyzed for the years 1973 to 1982. Distinctly different occurrence rates are observed at the two stations especially in the early post-sunset hours. Over Cachoeira Paulista the spread F occurrence rate at 20 and 21 LT increase by approximately a factor of 3 from low to high sunspot years and, starting from 22-23 LT, this rate of increase diminishes and even shows an inverse dependence with sunspot number toward early morning hours. Over Fortaleza, on the other hand, the spread F occurrence rate at 20-21 LT remains very high (90-100 percent) with no variation from solar minimum to maximum epochs. The spread F occurrence rate, that appears to be nearly independent of sunspot number, remains high up to midnight and falls towards morning hours. These results are interpreted on the solar activity control on the statistical behavior of plasma bubble vertical rise velocity and F-region dynamo electric field. Author

N84-34081# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

TEMPORAL AND LATITUDINAL DISTRIBUTION OF IONOSPHERE IRREGULARITY IN BRAZIL, DATA ANALYSIS OF SCINTILLATIONS IN VERY HIGH FREQUENCIES AND IONOGRAMS M.S. Thesis [DISTRIBUICAO TEMPORAL E LATITUDINAL DAS IRREGULARIDADES IONOSFERICAS NO BRASIL, ATRAVES DE ANALISE DE DADOS DE CINTILACAO EM VHF E IONOGRAMAS]

Osman Rosso Nelson Jul. 1984 107 p refs In PORTUGUESE; ENGLISH summary

(INPE-3179-TDL/172) Avail: NTIS HC A06/MF A01

Equatorial ionospheric irregularity distribution morphology, and dynamics, and the dynamics of the ambient ionosphere were investigated. Spread F data from ionograms over Fortaleza (4 S; 38 O) and Cachoeira Paulista (22, 7S; 45 O), and simultaneous VHF scintillations of geostationary satellite beacon received over Natal (5,6 S; 33, 7 degrees) were used to determine the irregularity local time versus seasonal distribution, over the equatorial and low latitude location, during the solar activity maximum as well as minimum epochs. Concept of flux tube alignment properties of the transequatorial plasma bubbles were used to determine statistical features of the plasma bubble rise velocities. Calculations of plasma bubble rise velocities were then carried out for different solar activity epochs and compared with prereversal enhancement amplitude in the F-layer vertical rise velocities, for the same epochs. Author

N84-34082# Naval Research Lab., Washington, D. C.

FINITE TEMPERATURE EFFECTS ON THE EVOLUTION OF IONOSPHERIC BARIUM CLOUDS IN THE PRESENCE OF A CONDUCTING BACKGROUND IONOSPHERE Memorandum Report, Oct. 1983 - Oct. 1984

S. T. Zalesak, P. K. Chaturvedi, S. L. Ossakow, and J. A. Fedder 24 Jul. 1984 54 p

(AD-A143592; NRL-MR-5346) Avail: NTIS HC A04/MF A01 CSCL 04/1

We show that under realistic ionospheric conditions, barium ion clouds hundreds of meters in diameter can be long-lived, quasi-stable, nonbifurcating structures. These structures may resemble tadpoles, with a dense head, steep density gradients at the front, and a long, less dense tail. We assume that these structures are the final products of the recursive bifurcation of a considerably larger barium ion cloud, i.e., striations. The realistic ionospheric conditions to which we refer consist of a barium ion cloud with ion temperatures Ti of approximately 1000 K, coupled electrically to a background ionosphere of lower compressibility than itself, i.e., and F region. We show analytically that this combination of finite Ti and relatively incompressible background results in an effective diffusion of barium plasma, but more importantly, of total magnetic-field-line-integrated Pedersen conductivity. The diffusion coefficient has a special form which allows the inner portions of the cloud to diffuse slowly, giving the cloud a long lifetime, and allows the outer, less dense portions of the cloud to diffuse rapidly, preventing cloud bifurcation. Numerical simulations of the full nonlinear dynamics are then used to show that this diffusion does in fact give rise to quasi-stable barium striations hundreds of meters in diameter. These findings are consistent with the linear analysis of Francis and Perkins (1975). Author (GRA)

N84-34083# Department of the Air Force, Washington, D.C.

ATMOSPHERIC CONTRAST TRANSMITTANCE MONITOR Patent Application

R. W. Johnson, inventor (to Air Force) 14 May 1984 23 p

(AD-D011167; US-Patent-Appl-SN-610142) Avail: NTIS HC A02/MF A01 CSCL 04/1

Document describes an atmospheric contrast transmittance monitor which comprises an electro-optical system including three solid state transducer assemblies interfaced with a small dedicated microprocessor for control of the system in either semi-automatic or operator interactive modes for real-time monitoring of the optical state of the atmosphere, one assembly comprising a compact multi-channel nephelometer of novel configuration for providing directional volume scattering function measurements on atmospheric samples, and a pair of staring fisheye lens scanners and associated detectors for scanning the upper and lower hemisphere radiance distributions. The system requires only a few hundred watts of input power and is less than one meter in length overall, and, operating in pulsed mode, has been used to measure the scattering characteristics of clear-day room air, with adequate sensitivity to suggest the capability of measurements approaching 0.00001/m, i.e., sea level molecular. Author (GRA)

N84-34084# Midwest Research Inst., Golden, Colo. Renewable Resource Assessment and Instrumentation Branch.

INSOLATION ASSESSMENT STUDIES Progress Report, FY 1982-1983

May 1984 101 p refs

(Contract DE-AC02-83CH-10093)

(DE84-004523; SERI/PR-215-2214) Avail: NTIS HC A06/MF A01

Research in insolation assessment concentrated on broadband model development and evaluation and spectral measurements and modeling. The need for high quality data was shown by evaluation of models used to form the SOLMET and ERSATZ data bases. Comparisons of model estimates with high quality data show mean bias errors as great as 20%. Particularly, models results were poor for cloudy conditions. Advances in spectral research include development of a simple spectral model (SPECTRAL) and industry development of portable spectroradiometers. Both were used to generate spectral irradiance standards and to study the effects of clouds, air mass, and turbidity on solar cell performance. DOE

N84-34085# Geological Survey, Denver, Colo.

INTERPRETATIONS OF MAGNETIC ANOMALIES AT A POTENTIAL REPOSITORY SITE LOCATED IN THE YUCCA MOUNTAIN AREA, NEVADA TEST SITE

G. D. Bath and C. E. Jahren 1984 54 p refs

(Contract DE-AI08-78ET-44802)

(DE84-013723; USGS-OR-84-120) Avail: NTIS HC A04/MF A01

In the Yucca Mountain area, studies of the relation of magnetic properties to geologic features provided structural information at and near a potential site for storage of radioactive waste. Interpreted features include a tabular mass of magnetized sedimentary rock beneath thick deposits of volcanic rock, and 11 major faults that displace magnetized volcanic rock. The basis for mapping traces of faults and identifying their upthrown sides was developed elsewhere at Yucca fault in the relatively simple volcanic terrains of Yucca Flat. In the site area, analyses of aeromagnetic anomalies from a low altitude, east-west aeromagnetic survey show the Topopah Spring Member of the Paintbrush

Tuff as the primary source of anomalies from faulted sequences of volcanic rock. Faults related to belts of positive and negative anomalies surrounding the site were identified. The possibility that an east-west pattern of anomalies is related to structure crossing the site was investigated by an aeromagnetic survey. A significant reduction in amplitude of these anomalies resulted when effects of the deeply buried argillite were removed. DOE

N84-34086*# Los Alamos Scientific Lab., N. Mex.
ENERGETIC PARTICLE SOUNDING AT THE MAGNETOPAUSE AND IMPLICATIONS FOR MAGNETIC RECONNECTION
T. A. Fritz and D. J. Williams (Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.) 1984 13 p refs Presented at the Symp. on the Achievements of the IMS, Graz, Austria, 26-28 Jun. 1984 Sponsored in part by NASA
(Contract W-7405-eng-36)
(NASA-CR-173963; NAS 1.26:173963; DE84-014034; LA-UR-84-1966; CONF-8406150-1) Avail: NTIS HC A02/MF A01 CSCL 04A

Measurements of energetic particle three-dimensional distributions used to infer the structure and topology of the region of the subsolar magnetopause are reviewed. These data were obtained from the Medium Energy Particle Experiment on board the ISEE 1 and 2 satellites. DOE

N84-34087# Argonne National Lab., Ill.
CRYSTALLINE ROCKS OF THE LAKE SUPERIOR REGION, UNITED STATES, PART 2
W. Harrison, M. Sood, M. Flower, and M. Tisue Oct. 1913 76 p
(Contract W-31-109-eng-38)
(DE84-014802; ANL/ES-135-Pt-2) Avail: NTIS HC A05/MF A01

Information on exposed crystalline rocks in the Lake Superior region (Wisconsin, Minnesota, and the Upper Peninsula of Michigan) is presented. Maps of the geology of the Lake Superior region, the tectonics of the region, and the distribution of crystalline rock bodies in the region are also included. DOE

N84-33942# Duisburg Univ. (West Germany). Dept. of Electrical Engineering.
A METHOD FOR THE OPTIMIZATION OF THE GEOMETRY AND THE MAGNETIZATION OF MAGNETIZED BODIES THAT ARE ASSUMED FOR THE SOLUTION OF THE INVERSE MAGNETIC FIELD PROBLEM
Adalbert Beyer *In* ESA IGARSS 84. Remote Sensing: From Res. towards Operational Use, Vol. 1 Aug. 1984 p 537-541 refs (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

N84-33944# Institut Francais du Petrole, Rueil-Malmaison.
MODELING OF ELASTIC WAVE PROPAGATION BY FINITE DIFFERENCE AND FINITE ELEMENT METHODS
O. Gosselin, J. L. Teron, and L. Nicoletis *In* ESA IGARSS 84. Remote Sensing: From Res. towards Operational Use, Vol. 1 Aug. 1984 p 549-552 refs Prepared in cooperation with Societe Nationale Elf Aquitaine, Pau, France (For primary document see N84-33857 23-43)
Avail: NTIS HC A24/MF A01

N84-33968*# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. of Atmospheric Physics.
QUANTITATIVE DETERMINATION OF AEROSOL CONCENTRATIONS BY LIDAR WITH RESPECT TO VARIOUS RELATIVE HUMIDITIES
D. Paffrath and E. Kirchschlager *In* ESA IGARSS 84: Remote Sensing: From Res. towards Operational Use, Vol. 2 Aug. 1984 p 695-698 refs (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 04A

N84-34339*# Maryland Univ., College Park.
CONNECTION BETWEEN THE MAGNETOSPHERE AND IONOSPHERE
In its Solar Terrest. Phys. Jun. 1984 46 p refs (For primary document see N84-34332 23-88)
Avail: NTIS HC A25/MF A01 CSCL 04A

N84-34340*# Maryland Univ., College Park.
SUBSTORMS IN THE MAGNETOSPHERE
In its Solar Terrest. Phys. Jun. 1984 53 p refs (For primary document see N84-34332 23-88)
Avail: NTIS HC A25/MF A01 CSCL 04A

N84-34343*# Maryland Univ., College Park.
ASSESSMENT OF PLASMA TRANSPORT AND CONVECTION AT HIGH LATITUDES
In its Solar Terrest. Phys. Jun. 1984 34 p refs (For primary document see N84-34332 23-88)
Avail: NTIS HC A25/MF A01 CSCL 04A

N84-34344*# Maryland Univ., College Park.
HIGH LATITUDE IONOSPHERIC STRUCTURE
In its Solar Terrest. Phys. Jun. 1984 37 p refs (For primary document see N84-34332 23-88)
Avail: NTIS HC A25/MF A01 CSCL 04A

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N84-34088 Pittsburgh Univ., Pa.
LOCAL CLIMATOLOGICAL INVESTIGATION OF WIND FIELDS IN THE LOWER MONONGAHELA VALLEY OF ALLEGHENY COUNTY, PENNSYLVANIA Ph.D. Thesis
Bela L. Biro 1983 248 p
Avail: Univ. Microfilms Order No. DA8411624

Local wind fields of the planetary boundary layer have been randomly examined at 29 selected observation points in a sinuous valley. Surface wind directions and speeds were collected with tower mounted instruments attached to a mobile unit. The results of the analysis have led to the following major conclusions: (1) The direction of regional surface airflow over a dissected plateau is constantly being modified according to the configurations of the surface topography; (2) There is no significant average flow velocity difference existing between the surface winds of the plateau and the surface winds of the dissecting valleys; (3) Winds striking normal or near normal to the axis of a valley will cause the formation of semi-permanent horizontal eddies on the leeward side of the valley and infrequent upslope and downslope eddies on the windward side of the valley; (4) Winds striking in an oblique angle to the axis of a valley will tend to flow along the orientation of the valley axis; and (5) When regional surface wind velocity decelerates over the dissected plateau to 5 m/s or less, local wind circulations will emerge induced by the configurations of topography or by inadvertent human means. Dissert. Abstr.

N84-34089 Oklahoma Univ., Norman.
RETRIEVAL OF THERMAL AND MICROPHYSICAL VARIABLES IN OBSERVED CONVECTIVE STORMS Ph.D. Thesis
Conrad Lawrence Ziegler 1984 212 p
Avail: Univ. Microfilms Order No. DA8413988

The study of air flow in convective storms, the forces that regulate the flow, and the processes that produce hydrometeors of various kinds are all being studied intensively by meteorologists using Doppler radar observations. The research reported here proceeds from the observed motion through accompanying thermodynamic and microphysical processes to the analysis of hydrometeor content and thermal fields in thunderstorms. A three dimensional numerical kinematic cloud model employing fixed Doppler wind fields, is used to diagnose temperature and mixing ratios and assess the relative importance of the various thermodynamic, microphysical and transportive forcing mechanisms. The microphysical parameterization includes stochastic coalescence effects in warm clouds as well as wet and variable density dry hail growth. Preliminary model tests using input from a dynamically simulated cloud establish the accuracy of the retrieval scheme.

Real data tests indicate good agreement between retrieved and observed radar reflectivities, qualitative dynamic consistency between observed winds and retrieved buoyancies, and the model's ability to partition liquid and solid hydrometeors. Dissert. Abstr.

N84-34090*# Saint Louis Univ., Mo. Dept. of Earth and Atmospheric Sciences.
A KINETIC ENERGY STUDY OF THE MESO BETA-SCALE STORM ENVIRONMENT DURING AVE-SESAME 5 (20-21 MAY 1979) Interim Report
Matthew F. Printy and Henry E. Fuelberg Washington NASA Aug. 1984 112 p refs
(Contract NAS8-33370)
(NASA-CR-3820; NAS 1.26:3820) Avail: NTIS HC A06/MF A01 CSCL 04B

Kinetic energy of the near storm environment was analyzed by meso beta scale data. It was found that horizontal winds in the 400 to 150 mb layer strengthen rapidly north of the developing convection. Peak values then decrease such that the maximum disappears 6 h later. Southeast of the storms, wind speeds above 300 mb decrease nearly 50% during the 3 h period of most intense thunderstorm activity. When the convection dissipates, wind patterns return to prestorm conditions. The mesoscale storm environment of AVE-SESAME 5 is characterized by large values of cross contour generation of kinetic energy, transfers of energy to nonresolvable scales of motion, and horizontal flux divergence. These processes are maximized within the upper troposphere and are greatest during times of strongest convection. It is shown that patterns agree with observed weather features. The southeast area of the network is examined to determine causes for vertical wind variations. E.A.K.

N84-34091# Lincoln Lab., Mass. Inst. of Tech., Lexington.
A COMPARISON OF STORM TRACKING AND EXTRAPOLATION ALGORITHMS
John C. Brasunas 31 Jul. 1984 120 p refs
(Contracts DTFA01-80-Y-10546; F19628-8-C-0002)
(DOT-FAA-PM-84/1; ATC-124) Avail: NTIS HC A06/MF A01

The FAA requires short-term forecasts of the development and motion of high reflectivity regions to plan for weather avoidance in the en route and terminal areas. Specific needs include choice of air routes and anticipating when to open or close approach/departure gates, descent corridors, and runways. This report compares storm-tracking algorithms for making short-term (0-30 minute) forecasts of high reflectivity areas, to serve these air traffic control needs. The area forecasts are made by moving the key features of the current reflectivity map according to the velocities derived from the storm trackers. The NEXRAD centroid, correlation, and Crane peak-cell trackers are compared against themselves, persistence, and best-fit extrapolation. Two performance measures are used: (1) overlap of predicted versus actual areas; and (2) accuracy in flight-path choice. The second method is a new way of scoring the predictor performance and is particularly suited to aviation needs. Five storms are considered, three in Massachusetts and two in Oklahoma. The correlation and peak-cell trackers generally performed well in the Massachusetts storms, close to a best correlation fit extrapolator. The centroid tracker behaves erratically, due to contour merging and splitting. The centroid tracker performed well on compact, Oklahoma storms where the correlation and peak-cell trackers were misled by storm propagation, an effect to be expected when there is high vertical shear of the horizontal wind. It is recommended that either the correlation or centroid tracker be used, depending on the type of storm expected. The centroid tracker would be used on compact storms; the correlation tracker would be used on storms without substantial propagation. The forecasts appear to be skillful in predicting high-reflectivity areas; however, they are less skillful in anticipating flight-paths which do not intersect these areas. B.W.

N84-34092# Meteorological Satellite Center, Tokyo (Japan).
GMS OBSERVATIONS OF TYPHOON 8205, 8212, 8213
Jan. 1984 154 p In JAPANESE; ENGLISH summary
Avail: NTIS HC A08/MF A01

The transformation regime of the storm from a tropical to an extratropical nature, the effects caused by the interaction with another tropical cyclone, and the development of a cloud system are illustrated by meteorological charts, tables, and satellite imagery, which shows the tracks of three typhoons that occurred near the Marshall islands in 1982. The data collected was observed by Geostationary Meteorological Satellite 2 (GMS or HIMAWARI). S.B.

N84-34093# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
ATMOSPHERIC SCIENCE WORKSHOP ON THE METEOROLOGY OF THE ANTARCTIC REGION AT INPE [WORKSHOP SOBRE CIENCIAS DA ATMOSFERA NO INPE A METEORLOGIA DA REGIAO ANTARTICA]
Jul. 1984 35 p refs In PORTUGUESE; ENGLISH summary
Workshop held at Sao Jose dos Campos, Brazil, 27-29 Mar. 1984
(INPE-3202-RPE/460) Avail: NTIS HC A03/MF A01

The Antarctic Region acts as a heat sink which influences the climatic system as a whole and the Southern Hemisphere in particular. Research projects relating to this region were conducted. A workshop on atmospheric sciences which emphasized the meteorology of the Antarctic Region was conducted. The objective of the workshop was to assemble Brazilian meteorologists and oceanographers along with a few international specialists to view, plan, and coordinate the polar research to be conducted in Brazil. The past achievements and strategy and procedure to be adopted and recommendations for future research are discussed. E.A.K.

N84-34094# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
AUTOMATIC DRAWING OF SYNOPTIC CHARTS [TRACADO AUTOMATICO DE CARTA SINOTICA]
Sergio Roberto Matiello Pellegrino and Jose Antonio Goncalves Pereira Jun. 1984 25 p In PORTUGUESE; ENGLISH summary
(INPE-3146-RPE/456) Avail: NTIS HC A02/MF A01

A system (SINOGRAFO) developed to plot Synoptic charts, based on INPE's meteorological data bases is described. SINOGRAFO draws South America's contour and international political divisions, in Mercator projection and reads (from the data base) the data related to the meteorological stations indicating them on the map. Wind, pressure, temperature, past weather, present weather, cloud type and rain amount are also indicated. Author

N84-34095# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
SYNOPTIC METEOROLOGY IN ANTARCTICA [METEOROLOGIA SINOTICA DA ANTARTICA]
Manoel Alonso Gan Jul. 1984 28 p refs In PORTUGUESE; ENGLISH summary
(INPE-3201-NTE/222) Avail: NTIS HC A03/MF A01

The Antarctic Meteorology lectures offered by Dr. Andrew Carleton are described. The research topics chosen by various research workers are: the radiation balance, identification of cyclones through satellite images, blocking and interaction between Antarctic and middle latitudes. These studies clearly show the importance of the Antarctic Meteorology in the present day research of Southern Hemisphere Meteorology. Author

N84-34096# National Oceanic and Atmospheric Administration, Washington, D. C. Satellite Applications Lab.
TROPICAL CYCLONE INTENSITY ANALYSIS USING SATELLITE DATA
Vernon F. Dvorak Sep. 1984 53 p refs
(NOAA-TR-NESDIS-11) Avail: NTIS HC A04/MF A01

New and improved techniques for determining tropical cyclone intensity from satellite data have been developed. This paper contains descriptions of methods designed to be used with visible, enhanced infrared and digital infrared data. The analysis techniques all use cloud feature measurements and rules based on a model of tropical cyclone development to arrive at the current and future intensity of a tropical cyclone. The model describes tropical cyclone

development in terms of day by day changes in the cloud pattern of the storm and its environment. It contains cloud pattern descriptions at each stage of development and information on how they change with time. The enhanced and digital infrared techniques, when applied to storms of hurricane strength, rely almost entirely on measurements of the eye temperature and the temperature of the clouds around the eye for the intensity determination. The enhanced infrared technique requires the use of a new concept to deal with the common occurrence of a sudden spreading of cold clouds over the central features of the disturbance. B.W.

N84-34097# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
A SCIENTIFIC VISIT TO THE INSTITUTE OF POLAR STUDY OF JAPAN [VISITA CIENTIFICA AO INSTITUTO DE ESTUDOS POLARES DO JAPAO]
Yoshihiro Yamazaki Jul. 1984 38 p refs In PORTUGUESE; ENGLISH summary
(INPE-3161-NTE/221) Avail: NTIS HC A03/MF A01

The activities during a visit to National Institute of Polar Research and Meteorological Agencies of Japan are outlined. The visit was aimed to know, discuss and evaluate the studies that those organizations are conducting on Antarctic Region Meteorology and to elaborate a scientific cooperation plan with the Atmospheric Sciences Subprogramme of the Brazilian Antarctic Programme (PROANTAR), with special emphasis on the area of meteorology. A brief description of the visited Institute, its main activities, and existing facilities of this organization will be presented. Author

N84-34098# World Climate Programme, Geneva (Switzerland).
THE INTERNATIONAL SATELLITE CLOUD CLIMATOLOGY PROJECT (ISCCP) PRELIMINARY IMPLEMENTATION PLAN, REVISION 1
Nov. 1982 81 p refs
(WCP-35-Rev-1) Avail: NTIS MF A01; print copy available at WMO, Geneva

A five year global cloud climatology is proposed. The main characteristic of the cloud climatology sought is its globally uniform coverage of various indices of cloud cover, rather than the absolute accuracy of its representative of a particular cloud type in any particular area. Complimentary studies are required to determine the radiative properties of cloud fields. The coordination of research to validate the cloud algorithms and the cloud climatology produced by the project is discussed. The gathering and archiving of suitable radiance data is emphasized so that the conversion to real cloud information can be repeated when and if improved conversion techniques (cloud algorithms) become available.M.A.C.

N84-34099# World Climate Programme, Geneva (Switzerland). Inst. for Desert Research.
RAINFALL PATTERNS IN THE DESERT
Louis Berkofsky (Ben-Gurion Univ. of the Negev, Sede Boker) [1983] 85 p refs
(WCP-75) Avail: NTIS MF A01; print copy available at WMO, Geneva

A definition of desert climate and the most widely used system of climatic classification are presented. This system is based upon the relation between the mean annual precipitation and mean annual temperature. An aridity index, characteristics of desert rainfall, and the methods for measurement of desert rainfall, are discussed. Radar observations are the most accurate way of measuring rainfall, while gage estimates of ungaged points often have errors. For high accuracy, dense networks of gages are needed. Methods for predicting desert rainfall are divided into those for predicting continuous precipitation and those for predicting convective precipitation. Cloud model schemes are used in this context. A method for reversing the desertification process is suggested, by altering albedo at the Earth's surface. S.B.

N84-34100# World Climate Programme, Geneva (Switzerland).
REPORT OF THE MEETING OF EXPERTS ON THE DESIGN OF A PILOT ATMOSPHERIC-HYDROLOGICAL EXPERIMENT FOR THE WCRP
1983 79 p refs Meeting held in Geneva, 28 Nov. - 2 Dec. 1983
(WCP-76) Avail: NTIS MF A01; print copy available at WMO, Geneva

The design of a pilot atmospheric hydrological experiment for the World Climate Research Program (WCRP) are presented. The treatment of land surface processes in atmospheric general circulation models is discussed. Soil moisture and snow depth are computed from budget equations for water, snow and heat. Evaporation is measured by the Eddy correlation method, aerodynamic method, difference method, and energy balance method. The water budget computation is shown and precipitation, soil moisture and surface net radiation are measured, along with surface and groundwater run-off. Finally, a proposal for a pilot atmospheric hydrological experiment is presented. At present a variety of techniques has been developed to determine evaporation directly from flux measurements, or indirectly from basic meteorological parameters. These include the eddy-correlation method, the bulk aerodynamic formula, the difference method, the energy balance method, each having their advantages and shortcomings. Selection of the preferred measurement technique(s) will depend upon the types of vegetation for a particular site, the duration of the measurement period, the reliability and simplicity of instrumentation. S.B.

N84-34101# World Climate Programme, Geneva (Switzerland).
REPORT OF THE MEETING OF EXPERTS ON SEA ICE AND CLIMATE MODELLING
1983 243 p refs Meeting held in Geneva, 12-16 Dec. 1983
(WCP-77) Avail: NTIS MF A01; print copy available at WMO, Geneva

Three main objectives are discussed which relate to different time scales of climate predictability and focusses on the study of specific physical processes of the climate system within the defined objectives or streams. The FIRST STREAM is concerned with the response of the atmosphere to surface boundary forcings on a seasonal time scale (soil moisture, snow cover, SST, sea ice, and others) and it is aimed at establishing the physical basis for the prediction of anomalies over periods of one to two months. The SECOND STREAM is concerned with the international variability of the global atmosphere, mainly due to thermodynamic forcing by the tropical ocean, and possibly due to sea ice variations in both hemispheres. The THIRD STREAM addresses the long term variations of the climate and its response to man made influences. A strategy for sea ice research is proposed. M.A.C.

N84-34102# World Climate Programme, Geneva (Switzerland).
REPORT OF THE SECOND SESSION OF THE JSC/CCCO WOCE SCIENTIFIC STEERING GROUP
Jun. 1984 42 p Meeting held in Wormley, England, 23-28 Jan. 1984
(WCP-81) Avail: NTIS MF A01; print copy available at WMO, Geneva

World ocean circulation and the related effects on climatology are discussed. Topics include data acquisition for the development and testing of ocean models, heat and fresh water flux variability, components of ocean variability, and water mass volumes with ventilation times of 10 to 100 years. M.A.C.

N84-34103# World Meteorological Organization, Geneva (Switzerland).
REPORT OF THE SECOND SESSION OF THE INTERNATIONAL WORKING GROUP ON DATA MANAGEMENT FOR THE INTERNATIONAL SATELLITE CLOUD CLIMATOLOGY PROJECT (ISCCP)
1983 40 p Conf. held in New York, 25-27 May 1983
(WCP-52) Avail: NTIS MF A01

A plan, developed to evaluate procedures for processing and exchanging raw satellite data is discussed. A preliminary draft of the ISCCP data management plan and requirements for correlation data for deriving cloud parameters, and open issues and recommendations are discussed. A.H.

N84-34104# East Anglia Univ., Norwich (England). Climatic Research Unit.
SEASONAL CLIMATE SCENARIOS FOR EUROPE AND NORTH AMERICA IN A HIGH-CO2, WARMER WORLD
J. P. Palutikof, T. M. L. Wigley, and J. M. Lough Aug. 1984 79 p refs
(Contract DE-AC02-79EV-10098)
(DOE/EV-10098/5; TRO12) Avail: NTIS MF A01; print copy available at WMO, Geneva

Possible patterns of climatic change associated with CO2-induced warming in Europe and North America were estimated. Four sets of scenarios were prepared, each using different criteria for the selection of data used in the scenario construction process. For each scenario set, the changes predicted in a warm world were calculated for three climate variables: sea level pressure, temperature and precipitation. For one scenario set it was possible to investigate warm-world changes in temperature and precipitation variability. For Europe winters are expected to become colder (and more variable) over large parts of the continent. This cold zone is associated with an increase in blocking frequency. Rainfall should decrease overall in spring and summer, whereas autumn and winter should be wetter in a warm world. The North American scenarios for temperature and pressure exhibit much less interseasonal contrast than is the case of Europe. Temperatures are shown to be generally higher throughout the year in a warm world. Temperature variability should be lower. North America shares with Europe indications that winters will be wetter, but autumns are expected to be mainly drier. A.R.H.

N84-34105# Naval Postgraduate School, Monterey, Calif.
A STUDY OF ANTARCTIC REMOTE SITE AUTOMATIC WEATHER STATION DATA (1980-81) FROM THE ROSS ICE SHELF AREA M.S. Thesis
Suzanna Plott Hervey Mar. 1984 171 p
(AD-A143738) Avail: NTIS HC A08/MF A01 CSCL 04/2

The third generation of the Antarctic remote-site Automatic Weather Stations (AWS2B) was installed at various locations during Austral summer (1979/80). The quality and quantity of surface pressure, wind (speed and direction) and temperature data show a marked improvement over that of the earlier AWS platforms (1976 to 80) examined by personnel at the Naval Postgraduate School. Statistical processing of data from February 1980 to December 1981 was done in order to contribute to a base climatology for AWS sites and to investigate possible operational applications of the data to the United States Antarctic mission. Comparisons were made between synoptic reports collected at McMurdo, Antarctica and the data obtained from the surrounding AWS2B stations. GRA

N84-34106# Naval Postgraduate School, Monterey, Calif.
AN EVALUATION OF THE SPADS AUTOMATED CLOUD ANALYSIS PROGRAM M.S. Thesis
C. A. Moren Mar. 1984 140 p
(AD-A143987) Avail: NTIS HC A07/MF A01 CSCL 05/2

An evaluation of the Satellite Data Processing and Display System automated cloud and precipitation intensity analysis program is presented. The program uses the Geostationary Observational Environmental Satellite visual and infrared imagery to produce contoured digital displays of cloud amount, cloud type, cloud-top temperature, cloud-top height and precipitation intensity for an approximate 1024 x 1024 n mi area centered at 35 deg N 80 deg W. Verification consists of correlating surface and upper-air observations, pilot reports, automated radar summaries and a manual analysis of the satellite imagery to the contoured digital display from the automated cloud analysis program for five cases during the summer 1983. The test results indicate considerable skill, particularly for cloud amount, cloud-top temperature and cloud-top height. The cloud type and precipitation intensity results were generally consistent but further testing is required to refine the thresholds and the standard deviation values for discrimination of particular cloud types. GRA

N84-34107# Naval Postgraduate School, Monterey, Calif.
PREDICTABILITY OF INVERSIONS AT VANDENBERG (VBG) AFB, CALIFORNIA M.S. Thesis
Richard Boyd Wilkerson Mar. 1984 93 p
(AD-A144042) Avail: NTIS HC A05/MF A01 CSCL 04/2

Accurate prediction of variations in the height of atmospheric inversions are required for optimum utilization of modern weaponry. A marine atmospheric boundary layer model was used to explore the influence of land on predictions of the inversion heights. Data for this evaluation were obtained from rawinsonde observations taken at Vandenberg AFB, California for each season. Vertical velocities for these data were obtained by vertical integration of the moisture budget equation (Q-method). Results of the model output were compared graphically and by use of RMS error statistics. These results were very poor and revealed that strong land influences on diurnal variations yield inversion height fluctuations which the model cannot reproduce. Further development of the model is necessary to overcome problems caused by the land influence. GRA

N84-34108# Naval Postgraduate School, Monterey, Calif.
USE OF THE TENSOR PRODUCT FOR NUMERICAL WEATHER PREDICTION BY THE FINITE ELEMENT METHOD, PART 2 Interim Report, Apr. - Jun. 1984
R. E. Newton Jun. 1984 22 p
(AD-A144064; NPS-69-84-005-Pt-2) Avail: NTIS HC A02/MF A01 CSCL 12/1

This is Part 2 of a report-pair concerning application of the tensor product in solving large sets of simultaneous linear equations arising in finite element formulations of Numerical Weather Prediction problems. A rectangular region having a graded mesh with Dirichlet boundary conditions on all four edges is considered. Coefficient matrices are the mass matrix and the stiffness matrix of the finite element method. For the stiffness matrix, which appears in Poisson's equation, operation counts and storage requirements are compared with corresponding numbers for solutions by successive overrelaxation and Gaussian elimination. FORTRAN programs for implementation of the tensor product formulations are given. Author (GRA)

N84-34109# Naval Environmental Prediction Research Facility, Monterey, Calif.
RAIN RATE CLIMATOLOGIES OVER MARINE REGIONS Final Report
A. K. Goroch, T. Brown, and M. J. Vanderhill May 1984 85 p
(F52-55-T)
(AD-A144066; NEPRF-TR-08-04) Avail: NTIS HC A05/MF A01 CSCL 04/2

A method to relate archived marine meteorological observations to two-minute average rain rates is described. The method is used to produce maps that indicate the frequency of observation of critical rain rates (5,8, and 15 mm/hr) for the Atlantic, North Pacific and Indian Oceans. GRA

N84-34110# Deutscher Wetterdienst, Hamburg (West Germany). Meteorologisches Observatorium.
THE SPATIAL AND TEMPORAL DISTRIBUTION OF DIFFUSE AND DIRECT SOLAR RADIATION IN THE FEDERAL REPUBLIC OF GERMANY Final Report, Dec. 1982
Fritz Kasten, Klaus Dehne, Hein Dieter Behr, and Uwe Bergholter Bonn Bundesministerium fuer Forschung und Technologie Jun. 1984 128 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-125; ISSN-0340-7608) Avail: NTIS HC A07/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 27

The amount of incoming solar radiation at different times of the day and the year in different climatic regions was investigated for the planning of solar energy facilities. For most applications, the incident global radiation is to be separated into direct and diffuse solar radiation. The radiometric network of the German meteorological service was considerably extended. Records of global and diffuse solar radiation were obtained and used to

compute direct solar radiation. The radiation data combined with other meteorological parameters are presented and discussed.
Author (ESA)

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N84-34111 Rhode Island Univ., Kingston.
SHELF CIRCULATION STUDIES ON THE NORTHEASTERN UNITED STATES CONTINENTAL SHELF Ph.D. Thesis
Marlene Ann Noble 1984 156 p
Avail: Univ. Microfilms Order No. DA8414890

Between May 1975 and March 1979, several sets of instrumented arrays were deployed on the northeastern United States Continental Shelf to investigate subtidal shelf circulation patterns. Two longshelf arrays, which consisted of current meters, subsurface pressure sensors and cameras to photograph the seabed, were deployed in the winters of 1976 and 1978 from the Middle Atlantic Bight (MAB) to the southern flank of Georges Bank (a distance spanning 615 km). On the southern flank of Georges Bank, current meters were deployed for several years at a single site. Subtidal currents are found to be strongly correlated along the shelf (minimum coherence amplitudes of 0.6). The longshelf current consists predominantly of wind-forced motions and freely propagating events. Subtidal currents in the MAB are much stronger than on Georges Bank. The MAB/Georges Bank energy ratio for wind-forced currents is 20 and is 3 for freely propagating events.
Dissert. Abstr.

N84-34112# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
A FIRST ATTEMPT TO IDENTIFY AREAS OF HIGH PROBABILITY FOR THE OCCURRENCE OF SURFACE SKIPJACK SCHOOLS (KATSUWONUS PELAMIS), FROM AN ANALYSIS OF OCEANOGRAPHIC DATA FOR THE SOUTH-SOUTHEAST REGION OF BRAZIL [PRIMEIRA TENTATIVA DE IDENTIFICACAO DE AREAS FAVORAVEIS A OCORRENCIA DE BONITO-LISTRADO (KATSUWONUS PELAMIS), ATRAVES DA ANALISE DE DADOS OCEANOGRAFICOS NA REGIAO SUDESTE-SUL DO BRASIL]
Sydnea Maluf, Yasunobu Matsuura (Sao Paulo Univ.), and Jose Luiz Stech Nov. 1983 76 p refs In PORTUGUESE; ENGLISH summary
(INPE-2972-RPE/449) Avail: NTIS HC A05/MF A01

The areas of highest probability for the occurrence of surface skipjack schools (Katsuwonus pelamis), along the southeast coast of Brazil, were identified. The quarterly average depths of the 18 C isotherm and the dissolved oxygen content below 3,5 ml/l were determined for 10 deg latitude x 1 deg longitude squares, by the BOURROUGHS-6800 computer program. Statistical information is presented. Quarterly charts of the distribution of these two parameters were developed and the 50, 100 and 150 m isobaths were emphasized. The areas considered favorable for the occurrence of surface skipjack schools were obtained from a graphical integration of the data, to a depth of more than 50 meters, for both parameters. It is assumed that temperature is the limiting factor. The areas are distributed approximately along and parallel to the coast of the study area, in the four quarters. A comparison between the model charts and some skipjack catch data for the third quarter suggests good agreement between the two. The largest area which is considered favorable for the appearance of surface skipjack schools occurs in the first quarter, the smallest area is in the fourth quarter. E.A.K.

N84-34113# California Univ., Santa Barbara. Dept. of Biological Sciences.
PROPERTIES OF THE DEEP SCATTERING LAYER ANALYZED IN TERMS OF BIOLUMINESCENT BEHAVIOR OF ITS COMPONENTS Technical Report, 1 Mar. 1969 - 28 Feb. 1984
J. F. Case 28 Feb. 1984 13 p
(Contract N00014-69-A-0200)
(AD-A143849) Avail: NTIS HC A02/MF A01 CSCL 08/1

Bioluminescence provides an avenue to study cellular mechanisms of effector organ excitation and, at a higher lever of integration, may be used as a tracer of complex behavior, one which is especially valuable in the non-obtrusive study of behavior of nocturnal and deep-sea organisms. Our interest in bioluminescence began with the classical organism of this field of research, the firefly, which, after my introduction to marine biology, has had to share my interest with the infinitely rich and profoundly unknown (relative to terrestrial bioluminescence) bioluminescence of the oceans. ONR initially supported both work on terrestrial and marine bioluminescence, recognizing, I believe, that terrestrial systems, being so well known, might serve as guides to the study of more difficultly accessible marine systems. Thus, included in this report are investigations on fireflies which are still in progress.
GRA

N84-34114# Oregon State Univ., Corvallis. Coll. of Oceanography.
THERMISTOR CHAIN OBSERVATIONS DURING MILDEX (MIXED LAYER DYNAMICS EXPERIMENT) Data Report, Oct. - Nov. 1983
M. D. Levine, S. R. Gard, and J. Simpkins Jun. 1984 163 p
(Contracts N00014-79-C-0004; N00014-84-C-0218)
(AD-A143933; DATA-111; REF-84-9) Avail: NTIS HC A08/MF A01 CSCL 08/10

Temperature observations are presented from 4 Aanderaa thermistor chains suspended from a free-floating surface buoy during October-November 1983 near 33.5 N, 126.5 W as part of the Mixed Layer Dynamics Experiment (MILDEX). Each chain contained 11 sensors; the upper two were 30 m in length, the lower two were 100 m long. The shallowest sensor was a 73 m and the deepest at 803 m. Two types of plots of time series are presented for all the data: temperature and isotherm depth.
Author (GRA)

N84-34115# Naval Postgraduate School, Monterey, Calif.
SPATIAL STRUCTURES OF OPTICAL PARAMETERS IN THE CALIFORNIA CURRENT AS MEASURED WITH THE NIMBUS-7 COASTAL ZONE COLOR SCANNER M.S. Thesis
J. T. McMurtrie, Jr. Mar. 1984 151 p
(AD-A144070) Avail: NTIS HC A08/MF A01 CSCL 08/3

Optical variability across the continental slope and shelf off Central California was studied using Nimbus-7 Coastal Zone Color Scanner (CZCS) data. CZCS estimates of k(490), the irradiance attenuation coefficient at 490 nm, were expressed as optical depth 1/k(490). A modified atmospheric correction algorithm was used to account for water radiance at 670 nm. Time sequences of 1/k(490) were assembled and partitioned into four zonal transects, at different latitudes, spanning May through November in 1979, 1980 and 1982. Empirical Orthogonal Functions (EOFs) were calculated for each partition. The first EOFs are dominated by scales of order 180 km, with in all cases, a band of low optical depth water in the first 100 km adjacent to the coast. Scales decrease in successive EOFs, to about 40 km in the fifth EOF. The feasibility of joining EOFs from different partitions was demonstrated as a precursor for future applications to piecewise analysis of oceanic satellite data. Author (GRA)

N84-34116# Alaska Univ., Fairbanks. Geophysical Inst.
ARCTIC ICE ISLAND AND SEA ICE MOVEMENTS AND MECHANICAL PROPERTIES Quarterly Report, 1 Oct. - 31 Dec. 1983
W. M. Sackinger and W. J. Stringer 1984 130 p refs
(Contract DE-AC21-83MC-20037)
(DE84-014324; DOE/MC-20047/1631; QR-1) Avail: NTIS HC A07/MF A01

Research activities are presented for the following tasks: (1) ice island; (2) intrusion of the pack ice edge in the Chukchi Sea; and (3) spray ice adhesion to offshore structure coatings. With respect to the ice island portion of this project, the following

activities are planned: (1) use aerial photography, satellite imagery, and historical records to establish a time history of all of the ice shelves of Ellesmere Island; (2) establish positioning buoys on the existing ice islands to track their trajectories daily and to telemeter daily barometric pressure and temperature; (3) relate geostrophic winds to the observed trajectories; and (4) begin to build a pseudo-random model for ice island motion over the long term which would enable a determination of the probability of interaction between ice islands and offshore structures. The objective of task 2 is to investigate and analyze the causes and extent of summer time pace ice intrusions into the Chukchi Sea, which would interfere with exploration drilling and emplacement of permanent production structures. For task 3, a method for evaluating shear and tensile strengths of the interface bond between the sea spray ice layer and the structure or ship surface is planned. A second, more detailed task is to measure the mechanical properties of this bonded layer for a variety of candidate coatings, as functions of temperature, loading rate, strain rate, salinity, and ice type. DOE

N84-33846# Hokkaido Univ., Sapporo (Japan).
DISTRIBUTION OF PACK ICE OF OKHOTSK SEA COAST OF HOKKAIDO OBSERVED WITH SEA ICE RADAR NETWORK, JANUARY-APRIL 1983
Masaaki Aota, Toshiyuki Kawamura, Masayuki Oi, Masao Ishikawa, and Hiroki Fukushi *In its* Data Rept. Low Temp. Sci. Ser. A: Phys. Sci. 1983 p 33-55 In JAPANESE (For primary document see N84-33842 23-42)
Avail: NTIS HC A05/MF A01

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N84-34117*# National Aeronautics and Space Administration, Washington, D. C.
ULTRASTRUCTURAL ALTERATIONS IN SKELETAL MUSCLE FIBERS OF RATS AFTER EXERCISE
M. Akuzawa and M. Hataya Sep. 1982 18 p refs Transl. into ENGLISH from Japanese J. of Veterinary Sci. (Japan), v. 40, 1978 p 425-435 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3199)
(NASA-TM-76976; NAS 1.15:76976) Avail: NTIS HC A02/MF A01 CSCL 06B

Ultrastructural alterations in skeletal muscle fibers were electron microscopically studied in rats forced to run on the treadmill until all-out. When they were mild and limited to relatively small areas, the reconstruction of filaments ensued within 10 days without infiltration of cells. When they were severe and extensive, phagocytes infiltrated in the lesions and removed degenerative sacroplasmic debris from muscle fibers. A little later, myoblasts appeared and regeneration was accomplished in 30 days in much the same manner as in myogenesis. Author

N84-34118# European Space Agency, Paris (France).
PROTEIN SINGLE CRYSTAL GROWTH UNDER LOW GRAVITY
T. D. Guyenne, ed. and J. J. Hunt, ed. Jun. 1984 79 p refs Proc. of Joint ESA-DFVLR Workshop, Freiburg i. B., 19-20 Mar. 1984
(ESA-SP-1067; ISSN-0379-6566) Copyright. Avail: NTIS HC A05/MF A01

Application of protein crystals for structure and function analysis; crystallization of the membrane protein rhodopsin; fibrinogen, plasminogen, and tissue-type plasminogen activator roles in the fibrinolytic system; alpha-crustacyanin, the lobster carapace astaxanthin-protein; carbohydrate-protein interactions; protein single crystal growth under microgravity; and diffusion profiles in microgravity protein crystallization experiments on Spacelab were discussed. For individual titles, see N84-34119 through N84-34125.

N84-34119# Groningen Rijksuniversiteit (Netherlands). Lab. of Chemical Physics.
APPLICATION OF PROTEIN CRYSTALS FOR STRUCTURE AND FUNCTION ANALYSIS
J. Drenth *In* ESA Protein Single Crystal Growth under Low Gravity Jun. 1984 p 3-8 (For primary document see N84-34118 23-51)
Avail: NTIS HC A05/MF A01

The study of the enzyme phospholipase A2 is presented as an example of cooperation between biochemists and crystallographers. Crystal structure in and not in solution, X-ray analysis of protein crystals, diffraction patterns, binding of heavy atoms, and radiation damage are discussed. Author (ESA)

N84-34120# Nijmegen Univ. (Netherlands). Dept. of Biochemistry.
CRYSTALLIZATION OF THE MEMBRANE PROTEIN RHODOPSIN
S. L. Bonting, W. J. deGrip, and F. J. M. Daemen *In* ESA Protein Single Crystal Growth under Low Gravity Jun. 1984 p 9-13 refs (For primary document see N84-34118 23-51)
Avail: NTIS HC A05/MF A01

The physiological role and the chemical characteristics of the visual pigment rhodopsin are described and attempts to crystallize this water-insoluble membrane protein are reported. After many variations of precipitant, detergent, buffer and pH, small crystals (< 100 microns) too small to permit their use for X-ray diffraction studies, were obtained. A method to obtain larger crystals under microgravity conditions in the Eureca protein crystallization facility is summarized. Author (ESA)

N84-34121# Gaubius Inst., Leiden (Netherlands). Health Research Div.
FIBRINOGEN, PLASMINOGEN AND TISSUE-TYPE PLASMINOGEN ACTIVATOR: THEIR ROLE IN THE FIBINOLYTIC SYSTEM
W. Nieuwenhuizen, D. C. Rijken, and D. W. Traas *In* ESA Protein Single Crystal Growth under Low Gravity Jun. 1984 p 15-17 refs (For primary document see N84-34118 23-51)
Avail: NTIS HC A05/MF A01

Hemostasis is discussed. Disbalance between clot formation and dissolution can cause thrombotic or bleeding events, depending on which of the two processes predominates. During fibrinolysis, insoluble fibrin is degraded to soluble fragments by plasmin, which can be formed by activation of plasminogen by tissue-type plasminogen activator (t-PA). Fibrin is, however, not merely a plasmin substrate but also accelerates the t-PA mediated plasminogen activation. This acceleration is probably due to mutual interactions between plasminogen, t-PA and fibrin. Knowledge of the three-dimensional structure, obtained by X-ray analysis of crystals of the three proteins, contributes of the understanding of accelerated plasmin formation in the presence of fibrin.
Author (ESA)

N84-34122# London Univ. (England). Dept. of Biochemistry.
THE ALPHA-CRUSTACYANIN, THE LOBSTER CARAPACE ASTAXANTHIN-PROTEIN
P. F. Zagalsky *In* ESA Protein Single Crystal Growth under Low Gravity Jun. 1984 p 19-32 refs (For primary document see N84-34118 23-51)
Avail: NTIS HC A05/MF A01

The astaxanthin protein which provides the blue coloration of lobster carapaces is discussed. The native pigment, alpha crustacyanin, is oligomeric and dissociates at low ionic strength with the formation of a purple derivative, beta-crustacyanin. Eight beta-crustacyanin units are formed on dissociation of alpha-crystacyanin, each binding two astaxanthin molecules. Removal of the carotenoid prosthetic groups results in reversible dissociation of the pigments into apoprotein units of molecular weight 20,000 daltons, half the size of beta-crystacyanin units. The large bathochromic shift in the absorption spectrum of the carotenoid (160 nm) may be the result of polarization of the polyene by suitable charge groups of the protein, or of twisting of the polyene

about its double bonds. The manner in which such twisting could be brought about is outlined. Resonance Raman spectroscopy studies, favoring the polarization mechanism for the spectral shift, are discussed. Author (ESA)

N84-34123# Freiburg Univ. (West Germany). Inst. fuer Organische Chemie und Biochemie.
CARBOHYDRATE-PROTEIN INTERACTIONS
Jochen Lehmann *In* ESA Protein Single Crystal Growth under Low Gravity Jun. 1984 p 33-54 (For primary document see N84-34118 23-51)
Avail: NTIS HC A05/MF A01

The chemistry of carbohydrates and proteins is reviewed and typical carbohydrate-protein reactions are described. Antibody-antigen interactions; galactosylation of glycoprotein in serum; protein agglutination of blood cells; and mouse egg fertilization are recalled. Author (ESA)

N84-34124# Freiburg Univ. (West Germany). Chemisches Lab.
PROTEIN SINGLE CRYSTAL GROWTH UNDER MICROGRAVITY
Walter Littke and Christina John *In* ESA Protein Single Crystal Growth under Low Gravity Jun. 1984 p 55-64 refs (For primary document see N84-34118 23-51)
Avail: NTIS HC A05/MF A01

Production of single crystals under microgravity conditions on Spacelab is described. Crystals formed by salting out from solutions kept free of convection are 27 and 1000 times larger in volume than those produced in the same apparatus exposed to terrestrial gravitation. Solving the three dimensional molecular structure of proteins by X-ray diffraction analysis reveals its manifold functions (catalysis, transport, supporting functions). An essential condition for such structural investigations is the availibility of sufficiently large (1 mm in each dimension) and well shaped single crystals. Especially disadvantageous for such protein crystal growth is sudden multiseed formation. Instead of the desired few large crystals numerous small crystallites are formed which are useless for X-ray analysis. Experiments show that this effect is mainly due to convection which can be almost completely suppressed by crystallization in gels. Author (ESA)

N84-34125# European Space Research and Technology Center, Noordwijk (Netherlands). Space Science Dept.
DIFFUSION PROFILES IN MICROGRAVITY PROTEIN CRYSTALLIZATION EXPERIMENTS
A. Hahne *In* ESA Protein Single Crystal Growth under Low Gravity Jun. 1984 p 65-70 refs (For primary document see N84-34118 23-51)
Avail: NTIS HC A05/MF A01

The protein crystallization experiment of the First Spacelab Payload is discussed. The bulk of the precipitated crystals did not occur in the buffer chamber separating protein and salt chamber but in the protein chamber itself. This unexpected location can be explained by the diffusion conditions governing material fluxes under microgravity. Because all parameters necessary to describe the diffusion behavior of the involved substances are not known, assumptions and estimates had to be made concerning diffusion coefficients and flux equations. Nevertheless it can be shown that salt and protein fluxes are different by several orders of magnitude. As a result, the salt penetrates much faster into the buffer and protein chamber than the protein leaves it. Author (ESA)

N84-34126# Illinois Univ., Urbana. Dept. of Psychology.
THE EFFECT OF LESIONS IN THE PREOPTIC-ANTERIOR HYPOTHALAMUS ON THE REFLEXIVE RESPONSES OF RATS TO COLD STRESS Final Report, 7 May 1977 - 30 Jun. 1983
Evelyn Satinoff 15 Jul. 1984 6 p
(Contract N00014-77-C-0465)
(AD-A144020; AD-E751074; CTR-ONR-8301) Avail: NTIS HC A02/MF A01 CSCL 06/16

We have been investigating the hypothalamic control of the generation and maintenance of the circadian temperature rhythm (CTR). Using implanted telemetry devices and automatic drinking measures, we monitored the rhythms of body temperature and drinking in rats before and after various types of hypothalamic damage. When we divided the CTR up into five components phase, amplitude, limits, precision and period - we found that each component could be affected independent of the others. For instance, after lesions of the suprachiasmatic nuclei, the putative master clock in the brain, the phase was altered so that highest body temperature occurred several hours earlier than it did in normals. The amplitude of the CTR was attenuated in most, but not all lesioned rats, and the limits were lower than normal but shorter than 24 hrs, and the precision of the rhythms (when hourly body temperature rose above the daily mean body temperature) was not as regular. In rats with lesions of the medial preoptic area, the phase and period were normal, but the amplitude of the CTR was greatly exaggerated, as were the limits and the daily mean. In other studies we have shown that the amount of REM sleep is highly dependent on the ambient temperature. After basal forebrain (medial preoptic) lesions, rats that showed no REM sleep at one ambient temperature showed normal amounts at another on the same day. GRA

N84-34127# Research Inst. of National Defence, Umea (Sweden). Dept. 4.
THE STABILITY OF ATROPINE, STORED IN THE SWEDISH AUTOINJECTOR
Britt Karlsson and Viviann Oegren Apr. 1984 14 p refs In SWEDISH; ENGLISH summary
(FOA-C-40191-C3; ISSN-0347-2124) Avail: NTIS HC A02/MF A01; Research Institute of National Defence, Stockholm KR 50

The efficiency of stored and newly made atropine/toxogonin mixture, to compete with the traced 3 sub H-QNB (quinuclidinylbenzilate) binding at a muscarinic receptor was compared, giving a measure of the biological activity of atropine. No decreased activity of the atropine is noted after storage in the autoinjector for up to 15 yr. Author (ESA)

N84-34128# Joint Publications Research Service, Arlington, Va.
USSR REPORT: LIFE SCIENCES. BIOMEDICAL AND BEHAVIORAL SCIENCES
6 Sep. 1984 171 p refs Transl. into ENGLISH from various Russian articles
(JPRS-UBB-84-020) Avail: NTIS HC A08/MF A01

The current status of the biomedical, behavioral and life sciences in the Soviet Union is examined. Topics include aerospace medicine and related subjects in biochemistry, biophysics, immunology, terrestrial medicine, pharmacology, and psychology. Agrotechnology, biotechnology, genetics, molecular biology, public health, and virology are also discussed. For individual titles, see N84-34129 through N84-34133.

N84-34129# Joint Publications Research Service, Arlington, Va.
PHYSICAL TRAINING OF COSMONAUTS FOR INTERCOSMOS PROGRAM MISSIONS **c52**
A. V. Sedov and A. S. Suvorov *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-020) 6 Sep. 1984 p 1-6 refs Transl. into ENGLISH from Teoriya i Prakt. Fiz. Kultury (Moscow), no. 4, Apr. 1984 p 22-24 (For primary document see N84-34128 23-51)
Copyright. Avail: NTIS HC A08/MF A01

The preflight physical training of cosmonauts is examined as well as the physiological adaptation to the space environment. Experiments include work capacity, circulation, respiration, and exercises developed to increase the reserve capabilities of the cosmonauts M.A.C.

N84-34130# Joint Publications Research Service, Arlington, Va.
EFFECTS OF PROLONGED WEIGHTLESSNESS ON ORCHIDACEAE PROTEINS Abstract Only
T. M. Cherevchenko, V. V. Shmigovskaya, I. V. Kosakovskaya, and I. I. Chernyadyev *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-020) 6 Sep. 1984 p 7 Transl. into ENGLISH from Dokl. Akad. Nauk Ukr. SSR Ser. B: Geol.,

Khim. i Biol. Nauki (Kiev), no. 5, May 1984 p 78-80 (For primary document see N84-34128 23-51)
Avail: NTIS HC A08/MF A01

The effects of long-term weightlessness (up to 6 months) on the electrophoretic mobility of soluble and structural proteins and D-ribulose-1,5-diphosphate carboxylase activity of the family Orchidaceae are studied in the leaves of five species: Epidendrum radicans, Doritis pulcherrima, Haemaria discolor, Paphiopedillum insigne and Physosiphon loddigesii. Prolonged weightlessness induced an increase in the number rapidly-migrating soluble and structural proteins in the case of Epidendrum, Haemaria, and Physosiphon. In Paphiopedillum, the number of rapidly-migrating fractions decreased, and, in Doritis, the number remained essentially unchanged. All changes are reversible. Activities of carboxylase are depressed only in Haemaria and Physosiphon, while the activities in the other species remain refractory to change or actually show an increase (Doritis, Epidendrum) after termination of exposure. Weightlessness significantly affects orchid metabolism, including photosynthesis. M.A.C.

N84-34131# Joint Publications Research Service, Arlington, Va.
GENETIC STUDY OF PLASMID INTEGRATION IN YEAST CHROMOSOMES. REPORT 1: EFFECT OF INTEGRATION OF EPISOMAL PLASMID IN MEIOTIC CROSSOVER IN CHROMOSOME 3 Abstract Only
S. A. Bulat and I. A. Zakharov *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-020) 6 Sep. 1984 p 61 Transl. into ENGLISH from Genet. (Moscow), v. 20, no. 2, Feb. 1984 p 197-204 (For primary document see N84-34128 23-51)
Avail: NTIS HC A08/MF A01

The integration of chimeral plasmids into heterological genomes such as those of Saccharomycetes is investigated. The strain used is S. cerevisiae and a related hybrid. A minimum synthetic medium with added amino-acids and nitrogen bases is used for culturing. Clones are sought that contained integrated plasmids with selected instability features, as confirmed by tetrad analysis. Clones with a stable Leu+ trait contain the desired plasmid. Mapping shows that the plasmid integrated at locus leu2 of chromosome three for stable integrants 2-8-7 and 2-8-8 and in an unidentified chromosome in stable 2-8x. The presence of the yeast transposon Tyl in plasmids with the LEU2 gene is taken to indicate random integration. The maps show that plasmid integration in locus leu2 suppresses crossover in the leu-MAT centromer region. M.A.C.

N84-34132# Joint Publications Research Service, Arlington, Va.
GENETIC STUDY OF PLASMID INTEGRATION IN YEAST CHROMOSOMES. REPORT 2: ANALYSIS OF IRREGULAR MEIOTIC SEGREGATION Abstract Only
S. A. Bulat and I. A. Zakharov *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-020) 6 Sep. 1984 p 61-62 Transl. into ENGLISH from Genet. (Moscow), v. 20, no. 2, Feb. 1984 p 205-211 (For primary document see N84-34128 23-51)
Avail: NTIS HC A08/MF A01

Saccharomycetes yeast cells are used to determine the role of nonreciprocal recombination on markers of chromosome 3 where plasmid integration has previously taken place. The practical implications for protein production are also assessed. Episomal plasmid pYF91 is used based on bacterial plasmid pBR322 with fragments of yeast DNA containing the LEU-2 gene and the EcoRI-fragment of 2mu DNA (2,4-megadalton). Meiotic segregation is studied in descendents of the stable integrants 2-8-7, 2-8-8 and 2-8x of genotype MATaleu2-3 (with marker LEU2 BLA) of ura3, crossed with strain 88A-D3008 of genotype MATalpha leu2-3 2-112 his 4. One or two segregants are always unstable and the Leu-2+ trait more than 50% of the time. The diploid 2-8xX88A does not show conversion segregation at leu2, has infrequent loss of integrated plasmid material and no homozygotization at the his4 marker. The irregularities of the segregation process are summarized. M.A.C.

N84-34133# Joint Publications Research Service, Arlington, Va.
OBTAINING YEAST VECTOR MARKED BY MUTATION OF MULTIPLE ANTIBIOTIC RESISTANCE Abstract Only
O. V. Nevzglyadova and A. G. Smolyanitskiy *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-020) 6 Sep. 1984 p 62 Transl. into ENGLISH from Genet. (Moscow), v. 20, no. 2, Feb. 1984 p 212-218 (For primary document see N84-34128 23-51)
Avail: NTIS HC A08/MF A01

Mutants of Sacch, cerevisiae are produced that have resistance to several antiobiotics at the same time. The Ant(R) mutation and its relationship to 2mu DNA is studied its value as a marker for yeast vector plasmid in its replicative part. The Ant(R) localized using cytoduction and transformation methods. Various MATa and MATalpha genotypes, as well as an E. coli strain yeast vector pJDB219, are studied. The transmission of the Ant(R)-determinants are analyzed in individual heterokaryotic clones. Among some 50 analyzed retransformants obtained by introducing hybrid DNA into the DC-5 strain, eight are resistant to both tested antibiotics, and also show complete correlation between losses of Leu+- and Ant(R)-phenotypes, indicating linking of the Ant- and LEU2-genes. M.A.C.

N84-34152# Geneva Univ. (Switzerland). Inst. of Morphology.
MORPHOMETRIC AND BIOPHYSICAL STUDY OF BONE TISSUE IN IMMOBILIZATION-INDUCED OSTEOPOROSIS IN THE GROWING RAT
D. Uebelhart, J. M. Very, and C. A. Baud *In* ESA The Gravity Relevance in Bone Mineralization Processes Jul. 1984 p 73-78 refs (For primary document see N84-34138 23-52)
Avail: NTIS HC A06/MF A01

N84-34153# Brussels Univ. (Belgium). Hopital Erasme.
ANIMAL MODELS OF DISUSE OSTEOPOROSIS
M. Verhas, M. Hinsenkamp, N. Dourov, and A. Schoutens *In* ESA The Gravity Relevance in Bone Mineralization Processes Jul. 1984 p 79-81 refs (For primary document see N84-34138 23-52)
Avail: NTIS HC A06/MF A01

N84-34154# Centre d'Etudes et de Recherches de Medecine Aerospatiale, Paris (France).
USE OF PRIMATE MODEL IN WEIGHTLESSNESS BONE PHYSIOLOGY: GENERAL PROBLEMS
C. L. Milhaud, C. Nogues, and P. C. Pesquies *In* ESA The Gravity Relevance in Bone Mineralizarion Processes Jul. 1984 p 83-86 refs (For primary document see N84-34138 23-51)
Avail: NTIS HC A06/MF A01

N84-34155# Centre d'Etudes et de Recherches de Medecine Aerospatiale, Paris (France).
USE OF PRIMATE MODEL IN WEIGHTLESSNESS BONE PHYSIOLOGY. HISTOLOGICAL APPROACH AFTER ILIAC CREST BIOPSY
C. Nogues, C. L. Milhaud, and P. C. Pesquies *In* ESA The Gravity Relevance in Bone Mineralization Processes Jul. 1984 p 87-89 refs (For primary document see N84-34138 23-51)
Avail: NTIS HC A06/MF A01

52 AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and weightlessness.

N84-34134# Army Intelligence and Threat Analysis Center, Arlington, Va.
MILITARY MEDICAL JOURNAL, NO. 4, 1984
Apr. 1984 133 p refs Transl. into ENGLISH of Voyenno-Med. Zh. (Moscow), no. 4, Apr. 1984
(L-2718) Avail: NTIS HC A07/MF A01

Progress, research, and application in military medicine is reported. Topics included: epidemiology, diagnoses, toxicology,

climate, environmental effects, psychological effects, military personnel and exposure to different environments. For individual titles, see N84-34135 through N84-34137.

N84-34135# Army Intelligence and Threat Analysis Center, Arlington, Va.
PHYSIOLOGICAL-HYGIENIC CRITERIA OF MEDICAL SELECTION OF MILITARY SERVICEMENT FOR WORK IN A HOT CLIMATE
Yu. A. Ivanov *In its* Mil. Med. J., No. 4, 1984 Apr. 1984 p 56-60 Transl. into ENGLISH from Voyenno-Med. Zh. (Moscow), no. 4, 1984 p 42-44 (For primary document see N84-34134 23-52)
Avail: NTIS HC A07/MF A01

Identical heat tolerance of military personnal which is an important condition to preserve the health of military servicemen and to maintain effective and reliable actions in a hot climate is discussed. Heat adaptation can be increased in different ways by natural adaptation to heat or by artificial adaptation, specific adaptation in heat chambers. Such adaptation is subject to control and the time during which the necessary resistance to heat forms is determined. Nonspecific artificial heat adaptation is obtained by dosage of repeated physical loads and drugs. Identical high resistant to heat in all members of a collective cannot be guaranteed by use of the existing method for individual heat adaptation. In the adaptation process, heterogeniety of the collective relative to the indices of resistance to heat can increase. E.A.K.

N84-34136# Army Intelligence and Threat Analysis Center, Arlington, Va.
MEDICAL-PSYCHOLOGICAL PROBLEMS OF THE OCCUPATIONAL RELIABILITY OF FLIGHT PERSONNEL
V. A. Bodrov *In its* Mil. Med. J., No. 4, 1984 Apr. 1984 p 61-65 refs Transl. into ENGLISH from Voyenno-Med. Zh. (Moscow), no. 4, 1984 p 45-47 (For primary document see N84-34134 23-52)
Avail: NTIS HC A07/MF A01

Pilot reliability which depends on error-free pilot actions to achieve a specific goal in a certain way in interaction between equipment, crew members, and personnel of the flight supervisory group is discussed. Faulty actions is seen as the main indicator of pilot reliability. An important way to improve flight safety is to study the causes of bad pilot judgement. Some pilot errors are caused by an initial or latent form of illness, fatigue, or neuro-emotional disorders, and a reduction in functional potentials of the body which are not job related. Aviation physicians have to identify and study the causes of errors. As a rule, in such cases errors are made by pilots who have performed successfully flight assignments of similar complexity before the incident. The physician's effectiveness in the study of erroneous actions depends on his knowledge of theoretical and methodological principles. E.A.K.

N84-34137# Army Intelligence and Threat Analysis Center, Arlington, Va.
THE FUNCTIONAL CONDITION OF SEAMEN UNDER CONDITIONS OF THE SOUTHERN MARITIME AREA
V. V. Berdyshev *In its* Mil. Med. J., No. 4, 1984 Apr. 1984 p 66-72 Transl. into ENGLISH from Voyenno-Med. Zh. (Moscow), no. 4, 1984 p 48-51 Original language document was announced as A84-36596 (For primary document see N84-34134 23-52)
Avail: NTIS HC A07/MF A01

Physiological functional indicators are analyzed for seamen 18 to 25 years of age on a tropical coast for the period between voyages. Indirect indicators of work capacity and CNS functions, indicators of nonspecific resistance and vitamin excretion, and indicators of metabolite excretion in the urine are emphasized. The results are related to fatigue and recovery processes and to the dynamics of adaptation and readaptation. Author

N84-34138# European Space Agency, Paris (France).
THE GRAVITY RELEVANCE IN BONE MINERALIZATION PROCESSES
N. Longdon, comp. and O. Melita, comp. Jul. 1984 106 p refs Partly in ENGLISH and FRENCH Proc. of ESA Workshop, Brussels, 18-20 Jan. 1984; sponsored by ESA and Brussels Univ.
(ESA-SP-203; ISSN-0379-6566) Avail: NTIS HC A06/MF A01

Froude's number and the thickness of bones during growth; bone changes in acutely immobilized patients; computed tomography in assessing space flight induced bone loss; evaluation of bone mineral content; urinary excretion of hydroxylysyl glycosides as an index of bone metabolism; collagen and noncollagenous proteins in bone particles fractionated by gradient density fractionation; Wolff's law and the adaptation of bone to microgravity; mechanochemical effects in demineralization and mineralization of bone; mechanical force and cartilage metabolism; the gravity relevance on bone stresses by in vivo measurements; an electrochemical hypothesis of bone demineralization in weightlessness; electret effects on fractures; sensitivity of bone cell populations to weightlessness and simulated weightlessness; morphometric and biophysical study of bone tissue in immobilization-induced osteoporosis in the growing rat; animal models of disuse osteoporosis; primate models in weightlessness bone physiology; and glycosaminoglycans in fetal bone mineralization were discussed. For individual titles, see N84-34139 through N84-34156.

N84-34139# Technische Hogeschool, Eindhoven (Netherlands).
ON FROUDE'S NUMBER AND THE THICKNESS OF BONES DURING GROWTH
C. J. Snijders *In* ESA The Gravity Relevance in Bone Mineralization Processes Jul. 1984 p 3-6 refs (For primary document see N84-34138 23-52)
Avail: NTIS HC A06/MF A01

Relations according to which the magnitudes load, form and areas of load bearing cross sections, modulus of elasticity, and dynamic quantities remain attuned to each other during growth are outlined. It is shown that the dimensionless quotient formed by Froude's number and by the quantity strain remain constant during growth, using data on maximum walking speed and an observation regarding impact. A law of scale concerning the thickness of vertebrae during growth is given. Author (ESA)

N84-34140# Hopital Bellevue Saint Etienne (France). Dept. de Readaptation Medicale.
BONE CHANGES IN ACUTELY IMMOBILIZED PATIENTS: RESULTS AND PERSPECTIVES
P. Minaire *In* ESA The Gravity Relevance in Bone Mineralization Processes Jul. 1984 p 7-10 refs (For primary document see N84-34138 23-52)
Avail: NTIS HC A06/MF A01

The results of clinical observations and experimental studies of the effects of immobilization on bone are presented. Their relevance to the effects of weightlessness is emphasized. The perspectives of biological and physiological research are outlined. A loss of 1% to 2% of body calcium per month is revealed by bedrest studies. A reversal of the loss during the first 6 to 9 months is possible, but after this results suggest a new bone balance rather than a return to the status quo. Old people lose relatively less bone than adolescents. Author (ESA)

N84-34141# Eidgenoessische Technische Hochschule, Zurich (Switzerland). Inst. for Biomedical Engineering.
THE POTENTIAL OF LOW DOSE COMPUTED TOMOGRAPHY IN ASSESSING SPACE FLIGHT INDUCED BONE LOSS
P. Rueegsegger and M. Dambacher *In* ESA The Gravity Relevance in Bone Mineralization Processes Jul. 1984 p 11-14 refs Prepared in cooperation with Zurich University Hospital (For primary document see N84-34138 23-52)
(Grants SNSF-3.998.78; SNSF-3.802.82)
Avail: NTIS HC A06/MF A01

In order to study weightlessness effects on bone loss, high precision pre and post flight bone evaluations with a special purpose low dose computer tomography system and studies of the calcium regulating hormones during flight are proposed. Studies with low dose quantitative/computed/tomography show its potential for assessing space flight induced bone loss. Author (ESA)

N84-34142# Brussels Univ. (Belgium). Hopital Erasme.
CURRENT METHODS OF EVALUATION OF BONE MINERAL CONTENT
S. ElBanna (Centre Hospitalier de Montigny le Tilleul, Belgium), A. Schoutens, G. Spiegl, J. Dagnelie, and M. Collard (Centre Hospitalier de Montigny le Tilleul, Belgium) *In* ESA The Gravity Relevance in Bone Mineralization Processes Jul. 1984 p 15-19 refs (For primary document see N84-34138 23-52)
Avail: NTIS HC A06/MF A01

Invasive and noninvasive techniques which provide a sequential assessment of bone mass, in order to diagnose bone disease; monitor the course of bone changes with disease progression; and monitor the course of bone changes with therapy are reviewed. Radiographic techniques lack the sensitivity required for quantifying levels of change, associated with the development of pathological conditions. Radiogrammetry is relatively precise but not necessarily indicative of the axial bone changes. Photon absorptiometric techniques using single or dual energy sources offer a highly quantitative and precise means of determining the bone mineral content in appendicular and axial skeleton and therefore a better appraisal of early osteoporotic changes. Computed tomography offers advantages, but it is not widespread, for technical and economic reasons. Compton scattering and the total neutron activation technique give more precise determinations of either bone density or body calcium. Author (ESA)

N84-34143# Brussels Univ. (Belgium). Hopital Erasme.
URINARY EXCRETION OF HYDROXYLYSYL GLYCOSIDES AS AN INDEX OF BONE METABOLISM
Robert Askenasi *In* ESA The Gravity Relevance in Bone Mineralization Processes Jul. 1984 p 21-22 refs (For primary document see N84-34138 23-52)
Avail: NTIS HC A06/MF A01

Hydroxylysyl glycosides were measured in urine with an aminoacid analyzer in order to study the bone collagen metabolism. The main source of hydroxylysyl glycosides in urine must be collagen. As gal-hyl indicate the bone origin of collagen degradation, its measurement in urine could constitute a tool in the study of collagen breakdown during actual and simulated space flight. Author (ESA)

N84-34144# Katholieke Universiteit te Leuven (Belgium). Arthritis and Metabolic Bone Disease Research Lab.
ANALYSIS OF COLLAGEN AND NONCOLLAGENOUS PROTEINS IN BONE PARTICLES FRACTIONATED BY GRADIENT DENSITY FRACTIONATION
J. M. Mbuyi-Muamba, J. Dequeker, and G. Gevers *In* ESA The Gravity Relevance in Bone Mineralization Processes Jul. 1984 p 23-28 refs (For primary document see N84-34138 23-52)
Avail: NTIS HC A06/MF A01

Density gradient fractionation of bone powder was used to obtain information on the degree of mineralization of bone fractions under normal and pathological conditions in order to study age effects. Isolated bone fractions were analyzed for their collagen and noncollagenous components content. Results show that the density gradient fractionation technique is suitable for detecting different stages of mineralization in normal and pathological conditions. The chemical analyses of fractionated bone disclose matrix changes similar to those found in studies of age-related changes of bone matrix. Author (ESA)

N84-34145# Cologne Univ. (West Germany). Inst. fuer Anatomisches.
THE SO-CALLED WOLFF'S LAW AND THE ADAPTATION OF BONE TO MICROGRAVITY
B. Kummer *In* ESA The Gravity Relevance in Bone Mineralization Processes Jul. 1984 p 29-34 refs (For primary document see N84-34138 23-52)
Avail: NTIS HC A06/MF A01

Pauwel's theory on the functional adaptation of bone was used to derive a computer model to simulate bone remodeling according to Wolff's law. In the model, high stresses cause bone formation, low stresses lead to resorption. An upper tolerance limit of stresses is probable. Stresses above this limit cause pathological bone resorption. Adaptation to extreme microgravity includes therefore the danger that the skeleton might be destroyed by chronic overloading after sudden return to terrestrial gravity. Author (ESA)

N84-34146# Lausanne Univ. (Switzerland). Inst. de Physique Experimentale.
MECHANOCHEMICAL EFFECTS IN DEMINERALIZATION AND MINERALIZATION OF BONE
S. G. Steinemann *In* ESA The Gravity Relevance in Bone Mineralization Processes Jul. 1984 p 35-42 refs Prepared in cooperation with Institut Straumann (For primary document see N84-34138 23-52)
Avail: NTIS HC A06/MF A01

Using bio-energetics, it is postulated that the mechanical stimulus is part of an overall energy metabolism of calcified tissue; and that a direct link exists between the stimulus and the solubility concept for mineral turnover. Thus, the mechanical influences are treated on the same footing as hormonal and nutritional factors which control bone cell function and remodeling. The thermodynamic approach explains the time factor in the mechanical stimulus and numerical application shows considerable changes in free energy and equilibrium constants for phosphate solubility due to stress. Author (ESA)

N84-34147# Amsterdam Univ. (Netherlands). Dept. of Oral Cell Biology.
MECHANICAL FORCE AND CARTILAGE METABOLISM
J. P. Veldhuijzen and G. P. vanKampen *In* ESA The Gravity Relevance in Bone Mineralization Processes Jul. 1984 p 43-46 refs (For primary document see N84-34138 23-52)
Avail: NTIS HC A06/MF A01

Changes in the amount and in the properties of proteoglycans in the matrix of isolated chondrocytes as a result of intermittent compressive force were studied. Aggregated chick embryonic chondrocytes were exposed in vitro to intermittent compressive force (IC) of physiological magnitude. Proteoglycan synthesis and deposition in the intercellular matrix were increased as compared to control cultures. Guanidine-HCl extractions (0.5 M) reveal that, as a result of IC, the matrix shows much more coherence. Prostaglandins are probably involved in the cellular response to IC. Author (ESA)

N84-34148# Ecole Royale Militaire, Brussels (Belgium).
EVALUATION OF THE GRAVITY RELEVANCE ON BONE STRESSES BY IN VIVO MEASUREMENTS
R. Bourgois, F. Burny, and M. Hinsenkamp *In* ESA The Gravity Relevance in Bone Mineralization Processes Jul. 1984 p 47-52 refs (For primary document see N84-34138 23-52)
Avail: NTIS HC A06/MF A01

In order to determine bone-stresses and strains in vivo, an implantable strain gage transducer, fixed mechanically for short term measurements, and by bone ingrowth for long term measurements, was developed. The transducer was successfully implanted in a dog and a human subject. Author (ESA)

N84-34149# Brussels Univ. (Belgium). Service d'Orthopedie-Traumatologie.
ELECTROMECHANICAL HYPOTHESIS OF BONE DEMINERALIZATION IN WEIGHTLESSNESS
M. G. Hinsenkamp *In* ESA The Gravity Relevance in Bone Mineralization Processes Jul. 1984 p 53-58 refs (For primary document see N84-34138 23-52)
Avail: NTIS HC A06/MF A01

The effect of mechanical stress on local bone remodeling is discussed. The higher demineralization of weightbearing bones after weightlessness exposure confirms the importance of the mechanical effect. A mechanism which explains bone tissue reaction by the electromechanical properties of bone and a possible substitution of the mechanical stress by electromagnetic fields is suggested. Because of the specificity of the induced electrical parameters on the cellular response, it is premature to experiment

the existent induction patterns as preventive treatment of the demineralization in weightlessness. To define active electric stimulation, differences in local bone stresses between bone submitted to normal gravity condition and to weightlessness and their consequences on electric potential variations must be defined. Author (ESA)

N84-34150# Centre Hospitalier Univ. Purpan, Toulouse (France). Service Traumato-Orthopedie.
EXPERIMENTAL INVESTIGATION OF THE EFFECT OF ELECTRETS ON BONE HEALING [ETUDE EXPERIMENTALE DE L'EFFET DES ELECTRETS SUR LA CONSOLIDATION OSSEUSE]
P. Chiron, B. Delannes, J. Puget, G. Utheza, M. Ricard, J. P. Morucci, and J. Fabre *In* ESA The Gravity Relevance in Bone Mineralization Processes Jul. 1984 p 59-66 refs In FRENCH (For primary document see N84-34138 23-52)
Avail: NTIS HC A06/MF A01

The effect of electrostatic fields created by polarized polymers on recent fractures and on pseudoarthroses in rabbits was studied. The resulting callous was examined radiologically, mechanically and histologically in double blind tests. Results show that the electrets help to heal the pseudoarthroses, but do not accelerate healing of recent fractures. Electret discharge in vivo is 80% in 3 weeks. Electret discharge by X ray flux is discussed. Author (ESA)

N84-34151# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SENSITIVITY OF BONE CELL POPULATIONS TO WEIGHTLESSNESS AND SIMULATED WEIGHTLESSNESS
W. Eugene Roberts, Emily Morey-Holton, and Mary R. Gonsalves *In* ESA The Gravity Relevance in Bone Mineralization Processes Jul. 1984 p 67-72 refs Prepared in cooperation with University of the Pacific, San Francisco (For primary document see N84-34138 23-52)
Avail: NTIS HC A06/MF A01 CSCL 06P

A rat suspension model for simulating certain aspects of weightlessness is discussed. Perturbations in physiological systems induced by this head down suspension model are verified by flight data. Findings of a suppression of osteoblast differentiation help explain the inhibition of bone formation inflight and during Earth-bound simulations. Since the anatomical site for these studies was in the maxilla, which is gravity loaded but non weightbearing in ground-based simulations, the similarity of bone cell kinetic changes, both inflight and in the ground-based model, suggest that fluid shifts rather than unloading may play an important role in bone alterations, at least at this sampling site. Author (ESA)

N84-34152# Geneva Univ. (Switzerland). Inst. of Morphology.
MORPHOMETRIC AND BIOPHYSICAL STUDY OF BONE TISSUE IN IMMOBILIZATION-INDUCED OSTEOPOROSIS IN THE GROWING RAT **c51**
D. Uebelhart, J. M. Very, and C. A. Baud *In* ESA The Gravity Relevance in Bone Mineralization Processes Jul. 1984 p 73-78 refs (For primary document see N84-34138 23-52)
Avail: NTIS HC A06/MF A01

The effects of immobilization by nervous section, to simulate weightlessness, on the bones of growing rats were studied by histomorphometric and biophysical methods. A reduction of compact bone growth, resulting from a decrease of formation, and a decrease of trabecular bone volume, resulting from a decrease of formation and an increase of resorption, are shown. The degree of mineralization of compact bone tissue is low, not associated to an increase of crystallinity index; this characterizes a hypomineralization state. Calcitonin has no effect upon bone formation and mineralization, but decreases resorption of cancellous bone. No changes in crystallographic parameters are detected. Author (ESA)

N84-34153# Brussels Univ. (Belgium). Hopital Erasme.
ANIMAL MODELS OF DISUSE OSTEOPOROSIS **c51**
M. Verhas, M. Hinsenkamp, N. Dourov, and A. Schoutens *In* ESA The Gravity Relevance in Bone Mineralization Processes Jul. 1984 p 79-81 refs (For primary document see N84-34138 23-52)
Avail: NTIS HC A06/MF A01

Two animal models of disuse osteoporosis were used to study the modification of calcium loss, bone blood flow, and calcium clearance. In paraplegia, a sustained increase of bone blood flow, a demineralization of the skeleton (more pronounced in the trabecular bone of the epiphyse and metaphyse), clearance of calcium 45 decrease, and a temporary stimulation of bone marrow are noted. The pattern is not modified by an oral administration of indomethacin. In a model of tibial unloading, decrease in bone length on the other limb (overloading tibia) and a diminished bone density and bone calcium load on the unloading side are observed. Author (ESA)

N84-34154# Centre d'Etudes et de Recherches de Medecine Aerospatiale, Paris (France).
USE OF PRIMATE MODEL IN WEIGHTLESSNESS BONE PHYSIOLOGY: GENERAL PROBLEMS
C. L. Milhaud, C. Nogues, and P. C. Pesquies *In* ESA The Gravity Relevance in Bone Mineralization Processes Jul. 1984 p 83-86 refs (For primary document see N84-34138 23-51)
Avail: NTIS HC A06/MF A01

Problems associated with the use of primates in space, especially to study calcium metabolism, are reviewed. Primate model value advantages include phylogenetic closeness, vertical posture, model versatility, large size, and long restraint period tolerance. Disadvantages include heterogeneity, safety and sedentarity problems, large size, and ethical problems. Selection of species, ground simulations, practical problems associated with flights, experimental requirements, and scientific programs are discussed. Author (ESA)

N84-34155# Centre d'Etudes et de Recherches de Medecine Aerospatiale, Paris (France).
USE OF PRIMATE MODEL IN WEIGHTLESSNESS BONE PHYSIOLOGY. HISTOLOGICAL APPROACH AFTER ILIAC CREST BIOPSY
C. Nogues, C. L. Milhaud, and P. C. Pesquies *In* ESA The Gravity Relevance in Bone Mineralization Processes Jul. 1984 p 87-89 refs (For primary document see N84-34138 23-51)
Avail: NTIS HC A06/MF A01

A biopsy sampling technique in monkeys is described and results obtained under various physiological conditions, including antiorthostatic bedrest are discussed. An incision of 4 cm is performed both on the iliac crest and the anterior line of the pelvis. Tissues are dissected until bone is reached: muscle and superficial periost are spread and the crest is cut. The bone biopsy is 12 mm long on each side and may be divided into 3 parts to be immersed in fixative solutions. After resorption differentiated osteoblasts synthetise osteoid matrix on resorbed surfaces. The amount of newly formed osteoid tissue may be appreciated by measuring its surface section (thus its volume density) and its interface with marrow, giving surface density of osteoid. Information obtained on unstained sections includes distance between cementing line and quiescent bone surface, and calcification rate after labeling with fluorescent markers. Author (ESA)

N84-34156# Leiden Univ. (Netherlands). Lab. for Cell Biology and Histology.
GLYCOSAMINOGLYCANS IN FETAL BONE MINERALIZATION
C. G. Groot and J. K. Danes *In* ESA The Gravity Relevance in Bone Mineralization Processes Jul. 1984 p 91-93 refs (For primary document see N84-34138 23-52)
Avail: NTIS HC A06/MF A01

The role of glycosaminoglycans (GAG) in mineralization was studied by digesting the organic matrix of mineralization nodules of fetal bone with several enzymes in order to obtain more information about the possible presence and nature of GAG in these noduli. Electron microscopy suggests that the organic matrix

undergoes no change after digestion. It is concluded that there is no chondroitin-4-sulphate, chondroitin-6-sulphate, dermatan sulfate, keratan sulfate or hyaluronic acid present in the organic matrix in this stage of bone mineralization. Author (ESA)

N84-34157# Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario).
EMERGENCY HANDLING OF COMPRESSED AIR CASUALTIES
D. L. Henderson and B. A. Hobson Feb. 1984 25 p
(AD-A143598; DCIEM-84-C-16) Avail: NTIS HC A02/MF A01 CSCL 06/5

Work in compressed air is associated with a number of hazards, the most serious of which are the pressure-related injuries (burst lung and decompression sickness). Modern construction methods and newer decompression tables have considerably reduced overall risks. The newest treatment methods have similarly reduced morbidity and fatality risks when an accident occurs. This paper outlines the basics of emergency handling of casualties and the definitive treatment of pressure related accidents. GRA

N84-34158# Army Research Inst. of Environmental Medicine, Natick, Mass.
REGULATION AND CHARACTERISTICS OF COLD-INDUCED VASODILATION
C. A. Ohata, G. D. Powers, and P. H. Scaglione Mar. 1984 42 p
(AD-A143797; USARIEM-M18/84) Avail: NTIS HC A03/MF A01 CSCL 06/19

The regulation and patterns of cold-induced vasodilation (CIVD) were identified by simultaneously monitoring circulatory and thermal responses during local cold exposure of a hindlimb in 22 cats anesthetized with chloralose. The different patterns of CIVD were categorized as hunting, sustained, combination of hunting and sustained, or no CIVD. The different regulatory mechanisms mediating CIVD were classified as baroreceptor mediated, active vasodilation, or redistribution of blood flow to skin. These cold unacclimatized cats produced primarily a hunting pattern of CIVD which was regulated predominantly by baroreceptor reflexes. The proposed mechanism of this CIVD response involves a sequence of neural reflexes elicited by cold pain, cold pressor response, baroreceptor reflex, and CIVD providing feedback inhibition of cold nociception. Differences in the pattern and regulation of CIVD may be related to the level of cold adaptation, and may influence the effectiveness of peripheral cryoprotection provided by CIVD. GRA

N84-34159# Army Research Inst. of Environmental Medicine, Natick, Mass.
FLUID REPLACEMENT DURING HYPOTHERMIA
D. E. Roberts, J. G. Barr, D. Kerr, C. Murray, and R. Harris 2 Mar. 1984 23 p
(AD-A143807; USARIEM-M16/84) Avail: NTIS HC A02/MF A01 CSCL 06/16

Hypothermia produces acidoses, depressed cardiac function, hypovolemia and hypotension. This study was designed to examine the cardiovascular dynamics involved with restoration of the hypovolemia before rewarming. Mixed breed splenectomized adult dogs (n=16) were anesthetized with pentobarbital and cooled to a right atrial temperature of 25 deg C at a rate of 3 deg C/Hr. The animals were maintained at 25 deg C for 6 hours and rewarmed at 3 deg C/Hr. One group (1) was given no fluid, one group (2) was given saline (20% of plasma volume infused in 10 min.) two hours after reaching 25 deg C and one group (3) received saline just prior to rewarming. The hematocrit was elevated in all groups ($P<or=0.05$) upon cooling, but did not differ between groups even after saline was given. Cardiac output (CO) at 25 deg C was 35% of precooled values. The second group increased their CO by 15% with fluid and this CO was maintained higher than groups 1 or 3 for the next four hours. Plasma volume, heart rate, and cardiac contractility returned to control levels upon rewarming, but CO remained low (<or= 10%). The level of CO at the start of rewarming did not affect the final level of CO. GRA

N84-34129# Joint Publications Research Service, Arlington, Va.
PHYSICAL TRAINING OF COSMONAUTS FOR INTERCOSMOS PROGRAM MISSIONS
A. V. Sedov and A. S. Suvorov *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-020) 6 Sep. 1984 p 1-6 refs Transl. into ENGLISH from Teoriya i Prakt. Fiz. Kultury (Moscow), no. 4, Apr. 1984 p 22-24 (For primary document see N84-34128 23-51)
Copyright. Avail: NTIS HC A08/MF A01

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N84-34160*# Illinois Univ., Urbana. Dept. of Psychology.
THE WORKLOAD BOOK: ASSESSMENT OF OPERATOR WORKLOAD TO ENGINEERING SYSTEMS Final Report
D. Gopher Nov. 1983 24 p refs
(Contract NCC2-233)
(NASA-CR-166596; NAS 1.26:166596) Avail: NTIS HC A02/MF A01 CSCL 05H

The structure and initial work performed toward the creation of a handbook for workload analysis directed at the operational community of engineers and human factors psychologists are described. The goal, when complete, will be to make accessible to such individuals the results of theoretically-based research that are of practical interest and utility in the analysis and prediction of operator workload in advanced and existing systems. In addition, the results of laboratory study focused on the development of a subjective rating technique for workload that is based on psychophysical scaling techniques are described. Author

N84-34161*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
COMBINED EFFECT OF NOISE AND VIBRATION ON PASSENGER ACCEPTANCE
Jack D. Leatherwood Aug. 1983 35 p refs Presented at the 108th Meeting of the Acoustical Society of America, Minneapolis, 8-12 Oct. 1984
(NASA-TM-86284; NAS 1.15:86284) Avail: NTIS HC A03/MF A01 CSCL 05H

An extensive research program conducted at NASA Langley Research Center to develop a comprehensive model of passenger comfort response to combined noise and vibration environments has been completed. This model was developed for use in the prediction and/or assessment of vehicle ride quality and as a ride quality design tool. The model has the unique capability to transform individual elements of vehicle interior noise and vibration into subjective units and combining the subjective units to produce a total subjective discomfort index as well as the other useful subjective indices. This paper summarizes the basic approach used in the development of the NASA ride comfort model, presents some of the more fundamental results obtained, describes several application of the model to operational vehicles, and discusses a portable, self-contained ride quality meter system that is a direct hardware/software implementation of the NASA comfort algorithm. Author

N84-34162# Minnesota Univ., Minneapolis. Dept. of Psychology.
COMPUTER-BASED MEASUREMENT OF INTELLECTUAL CAPABILITIES Final Report, Sep. 1976 - Jan. 1983
D. J. Weiss Dec. 1983 29 p
(Contract N00014-76-C-0243; RR0-4204)
(AD-A144065) Avail: NTIS HC A03/MF A01 CSCL 09/2

The research program's objectives are described, and the research approach is summarized and related to the sixteen technical reports completed under this contract. Fifteen major research findings are presented. The implications of the research

findings and methods for future research in computerized testing and adaptive testing are described. Also included are abstracts of the sixteen technical reports. Author (GRA)

N84-34163# Navy Personnel Research and Development Center, San Diego, Calif.
SPATIAL PERFORMANCE, COGNITIVE REPRESENTATION AND CEREBRAL PROCEDURES Final Report, Oct. 1983 - May 1984
P. A. Federico Jul. 1984 22 p
(AD-A144095; NPRDC-TR-84-48) Avail: NTIS HC A02/MF A01 CSCL 05/10

To provide converging support that the integration of analog and propositional representational systems is associated with spatial ability, visual, auditory, and bimodal brain event-related potentials were recorded from 50 right-handed Caucasian male recruits at the Naval Training Center, San Diego. Sensory interaction indices were derived for these subjects who had taken the Surface Development Test of spatial ability. Product-moment correlations were computed between sensory interaction indices for eight cerebral sites and spatial ability test scores. Sensory interaction for left and right hemispheric regions was significantly related to spatial ability. As sensory suppression decreased, spatial ability increased. The results substantiated the theory that the visual-imaginal-analog and the auditory-verbal-propositional representational systems are implicated in spatial ability. The extent to which the cortex can inhibit or attenuate the interaction or integration between these dual symbol systems is associated with complicated spatial task performance. GRA

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N84-34164 Texas Univ., Austin.
MODELING AND CONTROL OF AN ON-BOARD OXYGEN GENERATION SYSTEM Ph.D. Thesis
Shih-Ying Wang 1983 211 p
Avail: Univ. Microfilms Order No. DA8414467

The molecular sieve dual bed pressure swing process (PSA), which is used to produce large quantities of enriched oxygen gas from the ambient air, was theoretically and experimentally investigated. The full order model was derived to solve a set of coupled nonlinear differential equations. The correct causality was assumed to save tremendous computation time. Good agreements were obtained between the simulation results and experimental data. The reduced order model was derived by treating each bed as two storage capacitors and implementing the equilibrium theory. This resulted in a fourth order model. Reasonable results can be obtained from this approach. When the system reaches steady state, it is found that PSA process can be described by only one bed. This leads to a second order model which can be used for the controller design purpose. Dissert. Abstr.

N84-34165*# National Aeronautics and Space Administration, Washington, D. C.
HUMAN CAPABILITIES IN SPACE
A. E. Nicogossian Oct. 1984 58 p refs
(NASA-TM-87360; NAS 1.15:87360) Avail: NTIS HC A04/MF A01 CSCL 05H

Man's ability to live and perform useful work in space was demonstrated throughout the history of manned space flight. Current planning envisions a multi-functional space station. Man's unique abilities to respond to the unforeseen and to operate at a level of complexity exceeding any reasonable amount of previous planning distinguish him from present day machines. His limitations, however, include his inherent inability to survive without protection, his limited strength, and his propensity to make mistakes when performing repetitive and monotonous tasks. By contrast, an automated system does routine and delicate tasks, exerts force smoothly and precisely, stores, and recalls large amounts of data, and performs deductive reasoning while maintaining a relative insensitivity to the environment. The establishment of a permanent presence of man in space demands that man and machines be appropriately combined in spaceborne systems. To achieve this optimal combination, research is needed in such diverse fields as artificial intelligence, robotics, behavioral psychology, economics, and human factors engineering. Author

N84-34166# Department of the Army, Washington, D. C.
A METHOD FOR PRODUCING NUTRITIONALLY DENSE FREEZE DRIED FOOD BARS Patent Application
D. Berkowitz, inventor (to Army) Filed 16 Apr. 1984 17 p
(AD-D011052; US-Patent-Appl-SN-600241) Avail: NTIS HC A02/MF A01 CSCL 06/8

A method of producing a nutritionally dense, freeze dried food item usually in bar form is described in which uncooked food ingredients are mixed together and then cooked until about 40% to about 60% of the water content is removed by evaporation. Then the partially dried mixture is formed into the desired shape, then frozen and dehydrated to a moisture level which would produce a shelf-stable product. The freeze dried bars are packaged in impermeable containers. Food bars prepared by this method dehydrate faster and to a greater extent than food bars prepared by processes incorporating a compression step. Author (GRA)

N84-34167# Royal Aircraft Establishment, Farnborough (England). Human Factors Group.
THE PERCEPTION OF SATURATION AND HUE ON COLOUR CATHODE RAY TUBES Final Scientific Report, 1 Feb. 1983 - 31 Jan. 1984
J. Laycock and F. A. Greene (AMRL, Wright-Patterson AFB, Ohio) 13 Jul. 1984 86 p
(Grant AF-AFOSR-0085-83)
(AD-A143645; EOARD-TR-84-19) Avail: NTIS HC A05/MF A01 CSCL 05/8

As a result of the use of color cathode ray tubes in military aircraft, an experiment is reported which considered the perception of hue at representative luminance levels. This experiment was conducted to test the theoretical lines of constant perceived hue in 1976 Uniform-Chromaticity-Space. A unique, computer-controlled tri-stimulus colorimeter was used to present two degree stimuli for hue match at luminance levels ranging from 250 to 2000 cd/sq m. GRA

N84-34168# Army Research Inst. of Environmental Medicine, Natick, Mass.
UPPER TO LOWER BODY MUSCULAR STRENGTH AND ENDURANCE RATIOS FOR WOMEN AND MEN
J. E. Falkel, M. N. Sawka, L. Levine, and K. B. Pandolf 30 Jun. 1984 24 p
(DA Proj. 3E1-62777-A-879)
(AD-A143821; USARIEM-M33/84) Avail: NTIS HC A02/MF A01 CSCL 06/19

This study examined possible gender differences for relative upper (elbow) to lower (knee) body strength and endurance, as well as relative flexion to extension strength and endurance. Seven women and nine men who were matched for both upper and lower body aerobic power were tested on an isokinetic strength instrument. Absolute isokinetic strength was lower ($p<0.01$) for the women than the men for all measurements. When strength was expressed per lean body weight, the women were weaker ($p<0.05$) only for elbow flexion strength. The women had a lower ($p<0.05$) upper to lower body strength ratio for flexion, but not for extension. There were also no differences ($p>0.05$) in isokinetic endurance fatigue decrements, or upper to lower body endurance ratios between genders. These data indicated that there were differences in absolute strength between the genders, but strength per lean body weight, as well as upper to lower body ratios for strength and endurance were similar for both genders. It was recommended that aerobic fitness and level of training be taken

into account strength and endurance were compared between the genders. GRA

N84-34169# Air Force Human Resources Lab., Brooks AFB, Tex.
VALIDATION OF RELATIVE-TIME-SPENT RATING SCALES Interim Report, Jul. - Dec. 1981
S. K. Garcia Jul. 1984 41 p
(AF Proj. 7719)
(AD-A144067; AFHRL-TP-84-11) Avail: NTIS HC A03/MF A01 CSCL 05/9

Relative-time-spent rating scales are used as the primary measuring device in task-oriented job inventories. These scales permit incumbents to report the amount of work time they spend on each task performed relative to time spent on other tasks. Measures of relative time spent are currently being collected by the Air Force and other governmental agencies; however, no consensus has been reached regarding the optimal scale format to use in obtaining time spent-performing data. The general lack of consensus regarding the optimal scale has stemmed primarily from the difference among scientists in their opinions about scaling procedures, scale construction, application of scales and validity of scales. This paper summarizes the results of a feasibility study conducted to validate various relative-time-spent scale formats. The criterion for validation was collected via direct field observations. The primary objective of this investigation was to determine the relative validity of binary (perform/not perform), 9- and 25-point scales using actual time spent and frequency of observed task performance criteria. Results of this investigation indicated that the 9-point relative-time-spent scale provided the optimal format for use in the Air Force occupational analysis program. Author (GRA)

N84-34170# California Univ., Berkeley. Lawrence Berkeley Lab. Applied Science Div.
CONTROL OF RESPIRABLE PARTICLES AND RADON PROGENY WITH PORTABLE AIR CLEANERS
Frederick J. Offermann, Richard G. Sextro, William J. Fisk, William W. Nazaroff, Anthony V. Nero, Kenneth L. Revzan, and Jane Yater Feb. 1984 98 p refs
(Contract DE-AC03-76SF-00098)
(DE84-013878; LBL-16659; EEB-Vent-83-22) Avail: NTIS HC A05/MF A01

Eleven portable air cleaning devices were evaluated for control of indoor concentrations of respirable particles and radon progeny. Following injection of cigarette smoke and radon in a room-size chamber, decay rates for particles and radon progeny concentrations were measured with and without air cleaner operation. Particle concentrations were obtained for total number concentration and for number concentration by particle size. In tests with no air cleaner the natural decay rate for cigarette smoke was observed to be 0.2 hr(-1). The electrostatic precipitators and extended surface filters had significant particle removal rates, and a HEPA type filter was the most efficient air cleaner. The air cleaners which were effective in removing particles were also effective in removing radon progeny. At low particle concentrations plateout of the unattached radon progeny is an important removal mechanism. It is found that the plateout rate for unattached progeny is 15 hr(-1). The unattached fraction and the overall removal rate due to deposition of attached and unattached nuclides are estimated for each radon decay product as a function of particle concentration. DOE

55 PLANETARY BIOLOGY

Includes exobiology; and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

No abstracts in this category.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.
For components see *33 Electronics and Electrical Engineering.*

N84-34171# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
SIMPLE MICROPROGRAMMED CONTROLLERS: AN ALTERNATE APPROACH [CONTROLES MICROPROGRAMADOS SIMPLES - UMA ALTERNATIVA ATRAENTE]
Almir Cavalcanti Lemos, Jr. Apr. 1984 12 p refs In PORTUGUESE; ENGLISH summary Presented at the 11th Seminario Integrados de Software e Hardware, Viscosa MG
(INPE-3069-PRE/486) Avail: NTIS HC A02/MF A01

The PROM and EPROM growing availability in the national market, together with the microprogramming characteristics, makes simple microprogrammed digital controllers implementation even more viable and attractive. After a brief comparison between the two implementation methodologies for a digital system control part: hardwired and microprogrammed controllers, that issue is illustrated with three simple microprogrammed controller structures. Author

N84-34172*# National Aeronautics and Space Administration, Washington, D. C.
SYSTEM DESIGN OF A REMOTELY OPERATED, PROGRAM CONTROLLED MEASUREMENT TABLE FOR THE CALIBRATION OF THE EGRET EXPERIMENT. PART A: PROGRAM CONTROL
Sep. 1984 57 p Transl. into ENGLISH of "Systemauslegung eines Fernbedienten, Prorammgesteuerten Messtisches fuer die Eichung des EGRET-Experiments. Teil A: Programmsteuerung" rept. DFVLR, 30 Aug. 1982 p 91-138 Sponsored in part by Albedo GMBH and Sondermaschinen Reiter and Co., GMBH Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-77758; NAS 1.15:77758) Avail: NTIS HC A04/MF A01 CSCL 09B

The structure of the program, the five priority levels, the drive routines, the stepwise drive plan, the figure routines, meander X and y, the range of measurement table, the optimization of figure drive, the figure drive plan, dialogue routines, stack processing, the drive for the main terminal, the protocol routines, the drive for the microterminal, the drive for the experiment computer, and the main program are discussed. Author

N84-34173# University of Southern California, Marina del Rey. Information Sciences Inst.
NAME SERVER DESIGN FOR DISTRIBUTED SYSTEMS
P. Mockapetris, J. Postel, and P. Kirton Jun. 1984 22 p
(Contract MDA903-81-C-0335)
(AD-A143634; ISI/RS-84-132) Avail: NTIS HC A02/MF A01 CSCL 09/2

Name servers are programs that provide a uniform method of naming resources and retrieving information about those resources in the context of a distributed system. This paper examines the main issues in name server design and considers some contemporary name servers in order to classify the common goals, methods, and tradeoffs. Author (GRA)

N84-34174# Naval Postgraduate School, Monterey, Calif.
DEVELOPMENT OF REAL-TIME ERROR ELLIPSES AS AN INDICATOR OF KALMAN FILTER PERFORMANCE M.S. Thesis
Joseph Jaros Mar. 1984 120 p
(AD-A143698) Avail: NTIS HC A06/MF A01 CSCL 09/2

An error ellipse plotting routine was developed to provide real-time indication of Kalman filter performance. The study included an evaluation of the Hewlett-Packard HP-86 computer system's capability for providing real-time tracking information and an evaluation of the computer's possible use on the three-dimensional underwater tracking range at the Naval Underwater Weapons Engineering Station, Keyport, Washington. A series of tracking runs were used to demonstrate both linear and extended Kalman filtering. Information obtained from the error ellipse was useful as a tool for indicating filter performance and for making decisions regarding filter parameter modification. The HP-86 provided accurate, reliable results and it could be used for on-line graphics. However, the computing speed of the HP-86 computer as used in this study was too slow for on-line processing of the three-dimensional tracking problem. Author (GRA)

N84-34175# Electronics Research Lab., Adelaide (Australia).
THE MICROCODE FOR THE CONTROL PROCESSOR OF THE ARO (ARRAY ORIENTED PROCESSOR) ARRAY PROCESSOR
D. J. Heilbronn Aug. 1983 59 p
(AD-A143765; ERL-0286-TM) Avail: NTIS HC A04/MF A01 CSCL 09/2

A high speed array processor (ARO) has been designed for the processing of radar in real time. The operation of the ARO is supervised by a bit-slice microprocessor (the Control Processor). This document contains a description of the microcode which was written for the Control Processor to enable it to interpret PDP-11 assembler code. Author (GRA)

N84-34176# Department of the Air Force, Washington, D.C.
SELECTION OF DATA FROM BUSSES FOR TEST Patent Application
J. L. Currier, inventor (to Air Force) Filed 30 May 1984 67 p
(AD-D011160; US-Patent-Appl-SN-615503) Avail: NTIS HC A04/MF A01 CSCL 09/2

A test computer has a direct memory access module, interface units, and a data select unit for each of several system busses. Only some of the data on each system buss is to be transferred to the direct memory access module. The data organized with a command or header word which may be followed by a number of data words. The principle is to first check the command word to see if any data items are desired from the particular transfer, and if they are to check the position of each data item to see if it is desired. The data select unit includes a select memory, a position counter, and a position memory. During a load mode information from the test computer is loaded into the memories and counter to designate what data is to be transferred from the system buss. During a run mode, input control circuits of a bus interface unit selects and supplies the command word to the data control unit to address the select memory, which indicates what items are to be transfered. A yes/no bit is read from the position memory for each position to determine if the data word is to be transferred, the position counter being incremented for the successive positions. If an ALL bit was set, all data following a command word is transfered until the next command word. Author (GRA)

N84-34177# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
REPORT OF THE WORKING GROUP ON LARGE-SCALE COMPUTING IN AERONAUTICS
Jun. 1984 110 p
(AGARD-AR-209; ISBN-92-835-1474-2) Avail: NTIS HC A06/MF A01

The economics that computational fluid dynamics have brought to aerodynamic design, in reducing the cost of wind tunnel testing and reduction in development time, are considerable. Emphasis will be placed on modelling flows of increasing complexity. There are inviscid and thin layer calculations, Reynolds averaged Navier-Stokes solutions and large eddy simulation. Three aspects of rocket technology are currently inhibited by inadequate computing resources modelling of combustion instability, holographic diagnosis of exhaust emissions; and modelling of kinetics from flame front to exhaust nozzle. Large scale computers would allow such modelling. The use of computers in aeronautics is dependent upon the power and storage capacity of the computers, ability to generate coordinate systems for complex configurations, algorithms for the solution of flow field equations, and the capability to model turbulent flows. Transonic small perturbation methods are used to calculate transonic flows. Nonlinear field methods are used for flows over complex shapes. The finite element method is also used. For future requirements, the major task of computing facilities will come from applications in the design of aircraft, helicopters, and missiles. S.B.

N84-34178# Joint Publications Research Service, Arlington, Va.
EAST EUROPE REPORT: SCIENCE AND TECHNOLOGY
11 Sep. 1984 51 p ref Transl. into ENGLISH from various East European articles
(JPRS-ESA-84-035) Avail: NTIS HC A04/MF A01

This serial report contains news items, abstracts and articles of scientific reports on aspects of science and technology including electronics, computer technology, science policy, and steel industry computer systems assessment. For individual titles, see N84-34179 through N84-34179.

N84-34179# Joint Publications Research Service, Arlington, Va.
SELECTIONS ON CSSR ELECTRONICS, COMPUTER TECHNOLOGY: MHB8804 INTEGRATED CIRCUIT
Peter Volf *In its* East Europe Rept.: Sci. and Technol. (JPRS-ESA-84-035) 11 Sep. 1984 p 1-20 ref Transl. into ENGLISH from Sdelovaci Techn. (Prague), no. 4, 1984 p 125 (For primary document see N84-34178 23-60)
Avail: NTIS HC A04/MF A01

The described circuit is a digital-analog switch designed primarily for switching purposes in new electronic exchanges produced under license in Tesla Liptovsky Hradok. In view of the wider possibilities for its applications that go beyond its use restricted to switching fields of electronic exchanges only, the objective is to familiarize the public with the properties and applications of the MHB8804 circuit. Author

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N84-34180# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
THE DEVELOPMENT OF LANAC/II LANGUAGE FOR CONCURRENT PROGRAMMING [O DESENVOLVIMENTO DA LINGUAGEM LANAC/II PARA PROGRAMACAO CONCORRENTE]
Sergio Donizetti Fischer, Vania Aparecida Dinardo Oleinki, and Celso deRennaeSouza Jun. 1983 23 p refs In PORTUGUESE Presented at the 10th Seminar. Integrado de Software e Hardware - SEMISH, Campinas, Brazil, 25-29 Jul. 1983
(INPE-2781-PRE/347) Avail: NTIS HC A02/MF A01

LANAC is an Algol type higher level language developed at Brazil's Institute of Space Research for use in concurrent programming. Its first version was utilized in HP2116 B and PDP11/10 minicomputers for acquisition and reproduction of meteorological data. The need for a refined version arose; thus, LANAC/II was developed using Portuguese. New features were introduced: real and shared time, commands for defining critical areas, mechanisms for assigning priorities to procedures, and other mechanisms for their suspension. The compiler language LANAC/II was originally written in the Algol of Burroughs 6800, and it will be programmed in Assembly on the SISCO MB8000 minicomputer. The analysis

of vocabulary and syntax and the translation of the program into intermediate codes has been implemented, the generation of codes is in the developmental phase, and in the near future the implementation of syntactic error correction will begin.
Transl. by B.G.

N84-34181# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
FLEXIBLE DISK DATA STORAGE UNIT [UNIDADE DE ARMAZENAMENTO EMDISCO FLEXIVEL]
Alvaro Armando Novais Ferreira Dec. 1983 72 p refs In PORTUGUESE Submitted for publication
(INPE-2982-RPE/451) Avail: NTIS HC A04/MF A01

The control unit of 5 1/4 inches flexible disks, based on INTEL 8085 microprocessor and consisting of six modules, is described. Flexible disks were first used in the early 1970's for mass storage in microcomputers, when IBM introduced its IBM 3740 system and replacing decks. The central processing unit (CPU) of the flexible disk control unit consists of an INTEL 8085 microprocessor, a latch, buffers, and EPROM memory bank of 8 K bytes. Memory expansion is comprised of 8 K bytes of static RAM memory. Serial interface is an INTEL USART 8251 capable of serial or parallel conversion of data acquired by the CPU and parallel/serial conversion of data to be transmitted by TTY or CRT. Power source requirements and circuits and the BR 500 flexidisk drive (two drives per minidiskette) are discussed. The software of the diskette controller is also described. Transl. by B.G.

N84-34182# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
INTRODUCTION TO PASCAL LANGUAGE [INTRODUCAO A LINGUAGEM PASCAL]
Santiago Alves Tavares Sep. 1983 49 p In PORTUGUESE Presented at the 6th CNMAC, ITA, Sao Jose dos Campos, Brazil, 26-30 Sep. 1983
(INPE-2888-PRE/408) Avail: NTIS HC A03/MF A01

A summary of PASCAL is presented. PASCAL was developed by Niklaus Wirth of Zurich. It was derived from Algol 60, but is more powerful and easier to use. It incorporates, in a coherent manner, concepts of structured programming as defined by Dahl et al. It is suitable for use in microcomputers with limited memories. The program of a language consists of two elements: description of tasks to be carried out, and description of data to be manipulated by these tasks. Tasks are defined by statements, and data by declarations and definitions. In Pascal, the program contains a heading and block. In addition to enumeration of basic programming features, concepts discussed include: identifiers, matrices, records, commands parameters of subprograms, functions, and the dynamic structure of data. Transl. by B.G.

N84-34183# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
PASCAL-MP: A LANGUAGE FOR THE ALGEBRAIC AND NUMERICAL MANIPULATION OF POLYNOMIALS [PASCAL-MP: UMA LINGUAGEM PARA MANIPULACAO ALGEBRICA E NUMERICA DE POLINOMIOS]
Jose Carlos Lombardi, Edson L. Franca Senne, and Santiago Alves Tavares Apr. 1984 5 p refs In PORTUGUESE; ENGLISH summary Trabalho a ser submetido ao 4th Congr. SBC - SEMISH - Seminario Integrado de Software e Hardware, a Realizar-se de 21-27 Jul. 1984, Vicosa, M. G.
(INPE-3057-PRE/477) Avail: NTIS HC A02/MF A01

The programming language PASCAL-MP, developed with the purpose of facilitating programming of systems envolving algebraic and numerical manipulation of multiple variable polynomials frequently seen in aerodynamics, celestial mechanics and structural calculus problems is presented. Author

N84-34184# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
PROCAOC: A PROGRAM FOR COMPUTATION, ANALYSIS AND OPTIMIZATION OF CIRCUITS [PROCAOC: UM PROGRAMA PARA CALCULO, ANALISE E OPTIMIZACAO DE CIRCUITOS EM MICROONDAS]
Claudemir Marcos daSilva Jun. 1984 15 p refs In PORTUGUESE; ENGLISH summary Presented at the 1st Simposio Brasileiro de Microondas, 23-25 Jul. 1984
(INPE-3135-PRE/526) Avail: NTIS HC A02/MF A01

A computer program for analysis and optimization of active and passive linear circuits composed by one, two, three and four port devices belonging to the library of elements internally defined is described. The statistical and sensitivity analysis of the circuit are made as well as many of the calculations concerning the design of linear and linearized circuits as the determination of the stability regions, input and output impedances, constant SWR and noise figure circles, etc. The facility of utilization of the program is shown through an example. Author

N84-34185# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
PROJECT ACTIVE AND PASSIVE MICROWAVE DEVICES WITH AUXILLARY COMPUTER M.S. Thesis [PROJETO DE DISPOSITIVOS ATIVOS E PASSIVOS EM MICROONDAS COM AUXILIO DE COMPUTADOR]
Claudemir Marcos daSilva Jun. 1984 136 p In PORTUGUESE; ENGLISH summary
(INPE-3152-TDL/169) Avail: NTIS HC A07/MF A01

A computer program for analysis and optimization of linear, active and passive, microwave circuits composed by one, two, three and four access devices is described. These devices belong to the library elements internally defined in the program. Sensitivity and statisical analyses of the circuit as well as many of the calculations involved in the design of linear microwave circuits are made. The models utilized in the analysis of the more complex elements are given and also some examples of utilization of the program in order to show its potentiality and to serve as an introduction to its rules of utilization. Author

N84-34186*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
PAYLOAD CREW TRAINING COMPLEX SIMULATION ENGINEER'S HANDBOOK
David L. Shipman Jul. 1984 31 p
(NASA-TM-86465; NAS 1.15:86465) Avail: NTIS HC A03/MF A01 CSCL 09B

The Simulation Engineer's Handbook is a guide for new engineers assigned to Experiment Simulation and a reference for engineers previously assigned. The experiment simulation process, development of experiment simulator requirements, development of experiment simulator hardware and software, and the verification of experiment simulators are discussed. The training required for experiment simulation is extensive and is only referenced in the handbook. Author

N84-34187*# Boeing Co., Seattle, Wash.
BGRID: A BLOCK-STRUCTURED GRID GENERATION CODE FOR WING SECTIONS
H. C. Chen and K. D. Lee Nov. 1981 46 p refs
(Contract NAS2-10676)
(NASA-CR-166317; NAS 1.26:166317) Avail: NTIS HC A03/MF A01 CSCL 09B

The operation of the BGRID computer program is described for generating block-structured grids. Examples are provided to illustrate the code input and output. The application of a fully implicit AF (approximation factorization)-based computer code, called TWINGB (Transonic WING), for solving the 3D transonic full potential equation in conservation form on block-structured grids is also discussed. Author

N84-34188# Oak Ridge National Lab., Tenn. Computer Sciences.
USER'S GUIDE FOR AN IBM PL/I IMPLEMENTATION OF THE INTERNATIONAL STANDARD ORGANIZATION DIS 8211 INFORMATION PROCESSING-SPECIFICATION FOR A DATA DESCRIPTIVE FILE FOR INFORMATION INTERCHANGE
A. A. Brooks, F. D. Hammerling, and B. N. McNeely Oct. 1983

59 p refs
(Contract W-7405-eng-26)
(ORNL/CSD-TM-207) Avail: NTIS HC A04/MF A01

An IBM PL/I implementation of the International Standard Organization DIS 8211 Information Processing - Specification for a Data Descriptive File for Information Interchange is described. This implementation is in the form of user callable, multiple entry PL/I subprograms that perform the functions necessary for the creation of and retrieval from these files. Two typical main procedures are included which make use of the general purpose subroutines. The first is a main procedure which creates the Data Descriptive File and which calls input routines to obtain the required input data. Two of these input routines are described. The second main procedure provides for the retrieval of records and fields from an existing Data Descriptive File and produces output lists of the data and field controls. M.A.C.

N84-34189# Sierra Energy and Acoustics Consultants, Sacramento, Calif.
DOCUMENTATION OF DATA PROCESSING PROCEDURES AND EXTENSION OF CLASS B DATA ANALYSIS Final Subcontract Report
Michael Shea, Daniel Mort, Sukhbir Mahajan, and Charles Newcomb Sep. 1983 171 p refs Prepared for Midwest Research Inst.
(Contract EG-77-C-01-4042)
(SERI/STr-254-2085) Avail: NTIS HC A08/MF A01

The objective of the SERI Residential Class B Passive Solar Performance Monitoring Program is to evaluate the thermal performance of selected passive solar residential buildings throughout the country. The objective here is to document the application of Class B procedures in the eleven-house California Class B project, and to extend the Class B analysis. A detailed discussion is presented which includes: a description and example of the procedure used to process data on-site; a complete step-by-step procedure used to analyze the data and extract the various performance parameters; a discussion of problems and solutions of data transfer from cassettes to mainframe computer; a description of the process used to measure the infiltration loss coefficient, the conduction loss coefficients of the envelope, and the furnace efficiency; and an extension of the Class B data to answer some of the questions of performance. In addition, topics like thermal mass placement, thermal comfort, occupant effects on solar performance, and peak electric load effects in solar houses are also addressed and tentative conclusions drawn. R.J.F.

N84-34190# Rochester Univ., N. Y. Production Automation Project.
EFFICIENT EDITING OF SOLID MODELS BY EXPLOITING STRUCTURAL AND SPATIAL LOCALITY
R. B. Tilove, A. A. G. Requicha, and M. R. Hopkins May 1984 23 p refs
(Grants NSF ECS-81-04646; NSF MEA-82-11424)
(TM-46) Avail: NTIS MF A01: print copy available at WMO, Geneva

Computer aided design systems based on solid modelers must provide fast visual feedback to users when objects are edited. This implies that boundary representations must be updated rapidly, because displays typically are generated from face, edge and vertex data. Algorithms are described for updating a boundary representation when an object's constructive solid geometry (CSG) representation is edited. The algorithms exploit the structural (representational) locality inherent in most object modifications by taking advantage of previously computed boundary representations for (sub-) objects that are not affected by the editing operations. Spatial locality is also exploited by re-computing boundaries only within the spatial region where changes can occur. The algorithms are efficient, and are guaranteed to produce valid solids because they are based on CSG. Author

N84-34191# Intelligent Software Systems, Inc., Amherst, Mass.
A SYSTEM FOR EMBEDDING DATA DISPLAYS IN GRAPHICAL CONTEXTS
A. C. Morse Jul. 1984 38 p Prepared in cooperation with Visual Intelligence Corp., Amherst, MA
(Contract N00014-83-C-0495; R18-688)
(AD-A143630; TR-84-7-1) Avail: NTIS HC A03/MF A01 CSCL 09/2

This report describes an interactive computer tool for data analysis that facilitates the graphical encoding of both the data and the domain-related cues. That is, the system allows the decision-maker to draw figures (e.g., schematics) that depict the problem domain, and to embed dynamic data displays within those figures. (For instance, the system enables the user to draw the schematic of a process and insert data displays - dials, strip charts - at various points in the schematic.) These dynamic data displays can either be selected from a library of predefined display formats (e.g., bar chart), including several formats not usually found in graphing packages (e.g., face display), or they can be created interactively by the user. To accomplish the latter, the systems includes the ability to define dynamic attributes of graphical objects, where the attributes change as a function of the data being analyzed. Author (GRA)

N84-34192# Northwestern Univ., Evanston, Ill.
METHODOLOGY FOR SOFTWARE MAINTENANCE Final Technical Report, 23 Apr. 1980 - 30 Nov. 1982
S. S. Yau Griffiss AFB, N.Y. RADC Feb. 1984 308 p
(Contract F30602-80-C-0139)
(AD-A143763; RADC-TR-83-262) Avail: NTIS HC A14/MF A01 CSCL 09/2

Improved techniques for specifying and implementing software modifications were developed including logical ripple effect analysis, logical and performance stability measures, and effective testing for software maintenance. An experiment was performed to analyze logical stability measurements. Author (GRA)

N84-34193# Naval Research Lab., Washington, D. C.
SOFTWARE FOR A COMPUTER CONTROLLED LASER DOPPLER VELOCIMETER Interim Report, Jun. - Aug. 1982
C. R. Kaplan, S. R. Lustig, and F. W. Williams 29 Jun. 1984 32 p
(DA Proj. F43-400)
(AD-A143786; AD-E000583; NRL-MR-5352) Avail: NTIS HC A03/MF A01 CSCL 20/6

Software, consisting of a main FORTRAN program and an assembly language driver, has been developed for the computer control of a laser Doppler velocimeter (LDV). This is part of a continuing effort in the use of the LDV to measure turbulence in combustion processes. A brief discussion of the LDV hardware is included. An illustrative example follows to demonstrate software capabilities. GRA

N84-34194# Naval Research Lab., Washington, D. C.
A STANDARD ORGANIZATION FOR SPECIFYING ABSTRACT INTERFACES Interim Report
P. C. Clements, R. A. Parker, D. L. Parnas, J. Shore, and K. H. Britton 14 Jun. 1984 19 p
(F21-243)
(AD-A143787; AD-E000582; NRL-8815) Avail: NTIS HC A02/MF A01 CSCL 09/2

NRL's Software Cost Reduction project is demonstrating the feasibility of applying advanced software engineering techniques to complex real time systems to simplify maintenance. To demonstrate the principles, the onboard software for the Navy's A 7E aircraft is being redesigned and reimplemented. The project is producing a set of model procedures and documents that can be followed by designers and producers of other software systems. GRA

N84-34195# Aeronautical Research Labs., Melbourne (Australia).
AN ASSEMBLY LANGUAGE PROGRAM FOR CALCULATING RANDOM DECREMENT SIGNATURES
P. M. Cox Dec. 1983 23 p
(AD-A143908; ARL/STRUC-MEMO-369) Avail: NTIS HC A02/MF A01 CSCL 09/2

Random decrement signatures are widely used in vibration analysis such as the testing of aircraft structures both in flight and on the ground. A method of calculating such a signature has been programmed in Assembly language for a NOVA 3 computer using data transfered from a NICOLET FFT analyzer. The program was written for a mini-computer so that it could be used for in-the-field analysis. As the method involves a large amount of data manipulation, Assembly language was used, instead of FORTRAN, because it is more efficient in terms of speed and storage. The input analog signals to the analyzer are transferred to the computer after digitizing. The signatures calculated are displayed on an oscilloscope using the digital/analog converters in the analyzer. The final result can be plotted on a digital plotter. After the signatures have been calculated the power spectra are determined using Fourier analysis. The analyzer is used to perform the Fourier transforms as this is faster than the algorithm on the NOVA 3. The program runs interactively allowing the operator to terminate the random decrement averaging process when desired. The results obtained from random vibration test on a CT4 tailplane, are given as an example of graphical output from this program.
GRA

N84-34196# Carnegie-Mellon Univ., Pittsburgh, Pa. Robotics Inst.
A COMPUTATIONAL PARADIGM FOR THREE DIMENSIONAL SCENE ANALYSIS
J. L. Crowley Apr. 1984 24 p
(AD-A143963; CMU-RI-TR-84-11) Avail: NTIS HC A02/MF A01 CSCL 14/5

This paper presents a computational paradigm for a system which will dynamically model the contents of a three dimensional scene. The dynamic scene model may be made available to processes which analyze and interpret the scene as a composition of objects, and processes which plan and execute actions based on the composition of the surfaces or objects in the scene. This computational paradigm is presented as a collection of processes and data structures, many of which are currently areas of active research. The system receives information in the form of a time sequence of stereo images. These images are immediately converted into an initial representation which facilitates the processing of later stages. The initial representation is then passed to a number of independent processes called shape experts. Each shape expert extracts information about three dimensional surfaces from a different source. Surface information is integrated with the information obtained over time to maintain a Composite Surface Model. The Composite Surface Model is then made available to process for planning, analysis, or object recognition. The framework is introduced, and then each of the components are examined. The problems associated with each component are discussed, and a brief description is given of current research in that area.
GRA

N84-34197# City Coll. of the City Univ. of New York. Dept. of Electrical Engineering.
OPTICAL ACQUISITION, IMAGE AND DATA COMPRESSION Annual Technical Report, 1 Mar. 1983 - 30 May 1984
G. Eichmann Jun. 1984 166 p
(Grant AF-AFOSR-0081-83)
(AD-A143984; Rept-447104-1; AFOSR-84-0611TR) Avail: NTIS HC A08/MF A01 CSCL 17/8

This report deals with the phase estimation of low-time-bandwidth product (TBP) signals. Phase and frequency of a signal is estimated for short observation time. The observation time or the spectral bandwidth is limited to the superresolving regime where the TBP is near unity. Two classes of signal estimation are presented. Superresolving frequency estimation is performed where the sinusoidal signals are buried in deep white Gaussian noise. Constrained optimization techniques, using linear programming are used to estimate the location of the spectral peaks of the sinusoidal signals. Time and frequency limited Hilbert transform analysis is used to reconstruct the phase from the amplitude, and the amplitude from the phase of a complex signal. In addition, three smoothing methods; a mathematical filtering method, a correction factor method, and a method of spectral partitioning, are used to improve the phase/amplitude estimate of the complex signal.
Author (GRA)

N84-33847# Hokkaido Univ., Sapporo (Japan).
BASIC PROGRAMS 2
Tamotsu Ishida *In its* Rept. Low Temp. Sci. Ser. A: Phys. Sci. 1983 p 57-71 In JAPANESE (For primary document see N84-33842 23-42)
Avail: NTIS HC A05/MF A01

N84-33960*# Arkansas Univ., Fayetteville. Dept. of Electrical Engineering.
DIGITAL COLOR SPACE TRANSFORMATIONS
R. W. Jing, V. H. Kaupp, W. P. Waite, and H. C. MacDonald *In* ESA IGARSS 84: Remote Sensing: From Res. towards Operational Use, Vol. 2 Aug. 1984 p 649-654 refs (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 09B

N84-33961*# Milan Univ. (Italy). Dept. of Physics.
INTERACTIVE AUTOMATIC SYSTEM (IASP): AN EXPERT SYSTEM TO HELP PHOTOINTERPRETATION
V. DeRos, P. Mussio, and G. M. Lechi (CNR, Milan) *In* ESA IGARSS 84: Remote Sensing: From Res. towards Operational Use, Vol. 2 Aug. 1984 p 655-660 refs (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 09B

N84-33962*# Science Applications Research, Riverdale, Md.
MULTIRESOLUTION SPATIALLY CONSTRAINED CLUSTERING OF REMOTELY SENSED DATA ON THE MASSIVELY PARALLEL PROCESSOR
J. C. Tilton *In* ESA IGARSS 84: Remote Sensing: From Res. towards Operational Use, Vol. 2 Aug. 1984 p 661-666 refs (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 09B

N84-33963*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ANALYSING REMOTELY SENSED DATA ON THE MASSIVELY PARALLEL PROCESSOR
James C. Tilton (Science Applications Research, Riverdale, Maryland) and James P. Strong *In* ESA IGARSS 84: Remote Sensing: From Res. towards Operational Use, Vol. 2 Aug. 1984 p 667-672 refs (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 09B

N84-33964*# Florence Univ. (Italy). Dipt. di Ingegneria Elettronica.
APPLICATION OF THE DISCRETE COSINE TRANSFORM TO REMOTE SENSING IMAGE DATA COMPRESSION
E. DelRe *In* ESA IGARSS 84: Remote Sensing: From Res. towards Operational Use, Vol. 2 Aug. 1984 p 673-676 refs (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 09B

62 COMPUTER SYSTEMS

Includes computer networks.

N84-34198*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
VALIDATION OF A FAULT-TOLERANT CLOCK SYNCHRONIZATION SYSTEM
Ricky W. Butler and Sally C. Johnson Sep. 1984 23 p refs
(NASA-TP-2346; L-15799; NAS 1.60:2346) Avail: NTIS HC A02/MF A01 CSCL 09B

A validation method for the synchronization subsystem of a fault tolerant computer system is investigated. The method combines formal design verification with experimental testing. The design proof reduces the correctness of the clock synchroniz ion

system to the correctness of a set of axioms which are experimentally validated. Since the reliability requirements are often extreme, requiring the estimation of extremely large quantiles, an asymptotic approach to estimation in the tail of a distribution is employed. M.A.C.

N84-34199*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SOFTWARE IMPLEMENTED FAULT-TOLERANT (SIFT) USER'S GUIDE
David F. Green, Jr., Daniel L. Palumbo, and Daniel W. Baltrus Aug. 1984 52 p
(NASA-TM-86289; NAS 1.15:86289) Avail: NTIS HC A04/MF A01 CSCL 09B

Program development for a Software Implemented Fault Tolerant (SIFT) computer system is accomplished in the NASA LaRC AIRLAB facility using a DEC VAX-11 to interface with eight Bendix BDX 930 flight control processors. The interface software which provides this SIFT program development capability was developed by AIRLAB personnel. This technical memorandum describes the application and design of this software in detail, and is intended to assist both the user in performance of SIFT research and the systems programmer responsible for maintaining and/or upgrading the SIFT programming environment. Author

N84-34200# Argonne National Lab., Ill. Mathematics and Computer Science Div.
IMPLEMENTATION OF MONITORS WITH MACROS: A PROGRAMMING AID FOR THE HEP AND OTHER PARALLEL PROCESSORS
E. L. Lusk and R. A. Overbeek Dec. 1983 65 p refs
(Contract W-31-109-eng-38; Grant NSF MCS-82-07496)
(ANL-83-97) Avail: NTIS HC A04/MF A01

We delineated the advantages of using monitors when implementing multiprocessing algorithms for the Denelcor HEP. In this report we give a detailed presentation of how monitors can be implemented on the HEP using a simple macro processor. We then develop the thesis that a small body of general-purpose monitors can be defined to handle most standard synchronization patterns. We include the macro packages required to implement some of the more common synchronization patterns, including the fairly complex logic discussed in [3]. Code produced using these macro packages is portable from one multiprocessing environment to another. Indeed, by recoding the set of basic macros (about 100 lines of code for the Denelcor HEP), most programs that we are now writing could be moved to any similar multiprocessing system. Author

N84-34201# University of Southern California, Marina del Rey. Information Sciences Inst.
THE DOMAIN NAME SYSTEM
P. Mockapetris Jun. 1984 17 p Presented at the IFIP 6.5 Working Conf., Nottingham, England, 1-4 May 1984
(Contract MDA903-81-C-0335)
(AD-A143618; ISI/RS-84-133) Avail: NTIS HC A02/MF A01 CSCL 09/2

The domain name system is a protocol and a set of servers which provides a uniform method for associating the names of resources (e.g., mailboxes, host names) to information about the resources (e.g., mail server addresses). The name database is distributed among multiple name servers scattered through one or more internets. The protocol provides tools for controlling both the distribution of the database and the responsibility for maintenance of the distributed pieces of the database. Author (GRA)

N84-34202# Sandia Labs., Albuquerque, N. Mex.
SANDIA NATIONAL LABORATORIES ADMINISTRATIVE DATA PROCESSING SYSTEMS
Roscoe H. McGee, ed. and Isaac R. Mitchell, ed. May 1984 110 p
(Contract DE-AC04-76DP-00789)
(DE84-014328; SAND-84-0231) Avail: NTIS HC A06/MF A01

The administrative data processing systems at Sandia Laboratories are divided into common systems, people systems, property systems, procurement systems, and financial systems. The common systems consist of a data dictionary/directory system, which captures data field descriptions, common data input and retrieval systems, and the accounting title master system, the central authority for the accounting system. The people systems support personnel activities at Sandia. The property systems support property, material, inventory, documents, and records. Descriptions of property control, property accounting, property inventory control system, classified material accountability, classified document accountability, and others, are included. Procurement systems support procurement activity, including production of hard copy, summarized data, and procurement reports. Financial systems include payroll, employee accounts, financial modeling, budget, and others. S.B.

63 CYBERNETICS

Includes feedback and control theory.

For related information see also *54 Man/System Technology and Life Support.*

N84-34203# Princeton Univ., N. J. Dept. of Mechanical and Aerospace Engineering.
ARTIFICIAL INTELLIGENCE THEORY AND RECONFIGURABLE CONTROL SYSTEMS Interim Technical Report
Robert F. Stengel 30 Jun. 1984 37 p
(Contract DAAG29-84-K-0048)
(AD-A143766; MAE-1664; ARO-20155.1-MA) Avail: NTIS HC A03/MF A01 CSCL 05/1

A program for the analytic and experimental investigation of reconfigurable control systems is described. Its principal objectives are to extend the theory of artificial intelligence and to develop practical methods of applying artificial intelligence heuristics, statistical hypothesis testing, and modern control theory to the reconfiguration of control systems following sensor failures, actuator failures, power supply or transmission failures, or unforeseen changes in dynamic characteristics. Objectives include the definition of typical failure modes and effects; formulation and investigation of algorithms for detection, identification, estimation, and control; numerical simulation of failure and reconfiguration; and experimentation using a microprocessor-based reconfigurable control system. Author (GRA)

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N84-34204*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
RATIONAL-SPLINE APPROXIMATION WITH AUTOMATIC TENSION ADJUSTMENT
James R. Schiess and Patricia A. Kerr Oct. 1984 13 p refs
(NASA-TP-2366; L-15826; NAS 1.60:2366) Avail: NTIS HC A02/MF A01 CSCL 12A

An algorithm for weighted least-squares approximation with rational splines is presented. A rational spline is a cubic function containing a distinct tension parameter for each interval defined by two consecutive knots. For zero tension, the rational spline is identical to a cubic spline; for very large tension, the rational spline is a linear function. The approximation algorithm incorporates an algorithm which automatically adjusts the tension on each interval to fulfill a user-specified criterion. Finally, an example is presented comparing results of the rational spline with those of the cubic spline. Author

N84-34205# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
WORST CASE PERFORMANCE OF SOME HEURISTICS FOR

LOT SIZE PROBLEMS [DESEMPENHO, NO PIOR CASO, DE ALGUMAS HEURISTICAS PARA PROBLEMAS DE TAMANHO DE LOTE]
Gabriel R. Bitran, Thomas L. Magnanti, and Horacio H. Yanasse May 1984 13 p refs In PORTUGUESE; ENGLISH summary Presented at the 17th Simposio Brasileiro de Pesquisa Operacional, Rio de Janeiro, Nov. 1984
(INPE-3134-PRE/525) Avail: NTIS HC A02/MF A01

The uncapacitated dynamic lot size problem was considered. The worst case performance of some heuristics which use the idea of minimizing the average cost per unit is presented. These heuristics have arbitrarily large errors. Author

N84-34206# Instituto de Pesquisas Especiais, Sao Jose dos Campos (Brazil).
EQUIVALENCE BETWEEN MAXIMIZATION PROBLEMS SUBJECTED TO INEQUALITY CONSTRAINTS [EQUIVALENCIA ENTRE PROBLEMAS DE MAXIMIZACAO SUJEITOS A RESTRICOES DE DESIGUALDADE]
Luiz A. N. Lorena and Paulo R. Oliveira Jul. 1984 19 p refs In PORTUGUESE; ENGLISH summary Presented at the 17th Simposio Brasileiro de Pesquisa Operacional, Rio de Janeiro, 7-9 Nov. 1984
(INPE-3166-PRE/536) Avail: NTIS HC A02/MF A01

A generalization of conjugate functions, superdifferentials and supergradients of the real function defined on R (supra m) is initially presented. These concepts are used to show the equivalence between a general maximization problem with inequality constraints (P) and a problem (P prime) with the same optimal solution and optimal valves than (P). Problem (P prime) is constructed by putting some constraints from problem (P) into its own objective function through a nondecreasing function belonging to a set of functions H. The equivalence between (P) and (P prime) is assured when the perturbation function of (P) is H-superdifferentiable at zero. Next, a search is made for a class of functions H which satisfies the equivalence conditions for the problem. Conditions in the vestors Gamma and Beta for the equivalents of (P) and (P prime) are derived. Finally, an application to discrete problems (PD) is considered. A simple example is shown and an algorithm is suggested to search for the optimal solution of (PD) through its equivalent (P.D.). Author

N84-34207# Rochester Univ., N. Y. Production Automation Project.
BOOLEAN OPERATIONS IN SOLID MODELLING: BOUNDARY EVALUATION AND MERGING ALGORITHMS
Aristides A. G. Requicha and Herbert B. Voelcker Jan. 1984 60 p refs
(Grants NSF ECS-81-04646; NSF MEA-82-11424)
(TM-26) Avail: NTIS MF A01; print copy available at WMO, Geneva

Boundary evaluation algorithms used by solid modelling systems developed at the University of Rochester are discussed. Other known approaches are discussed in terms of the concepts of set membership classification and neighborhood manipulation. R.J.F.

N84-34208# Stanford Univ., Calif. Information Systems Lab.
PIPELINED ORTHOGONAL DIGITAL LATTICE FILTERS
S. K. Rao and T. Kailath Mar. 1984 5 p
(Contracts MDA903-79-C-0680; DAAG29-79-C-0215; AF Proj. 2304)
(AD-A143902; AFOSR-84-0518TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

An algorithm is presented for the design of systolic arrays that implement single-input single-output time-invariant digital filters. The algorithm is then specialized to the case where the realized array consists only of orthogonal rotational modules and delay elements interconnected in such a manner as to render the circuit pipelineable. Author (GRA)

N84-34209# Brown Univ., Providence, R. I. Applied Mathematics Div.
ANALYSIS, MODELING AND CONTROL OF DYNAMICAL SYSTEMS Interim Report, 1 Oct. 1983 - 31 Mar. 1984
H. T. Banks and J. K. Hale Mar. 1984 7 p
(Grant AF-AFOSR-0198-81)
(AD-A143937; AFOSR-84-0507TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Efforts continue on methods for estimation and control in distributed systems. Numerical work has also begun on these techniques. A complete treatment for the problem of estimating coefficients and boundary parameters in hyperbolic systems such as those that arise in geophysical inverse problems is given. Author (GRA)

N84-34210# Los Alamos Scientific Lab., N. Mex.
SUPRACONVERGENCE AND FUNCTIONS THAT SUM TO ZERO ON CYCLES
V. Faber and Andrew B. White, Jr. 1984 8 p refs Presented at the 5th Intern. Conf. on the Theory and Appl. of Graphs, Kalamazoo, Mich., 4-6 Jun. 1984
(Contract W-7405-eng-36)
(DE84-013889; LA-UR-84-1746; CONF-8406147-1) Avail: NTIS HC A02/MF A01

The approximation of differential equations by difference equations defined on a given set of points (x sub 1) is an important area of numerical mathematics. Classical analysis of these methods says that if the truncation error is proportional to Delta(n) (where Delta = max (x sub 1-x sub 1-1)), then the approximation error is also proportional to Delta(n). Recently, however, it was discovered that this is not necessarily the case for irregular grids; the approximation might be supraconvergent with convergence rate greater than n. This anomaly is examined by looking at periodic meshes. DOE

N84-34211# Los Alamos Scientific Lab., N. Mex. Theoretical Div.
SOLUTION OF SIMULTANEOUS POLYNOMIAL EQUATIONS BY ELIMINATION IN MACSYMA
William A. Beyer 1984 12 p refs Presented at the 3rd MACSYMA Users Conf., Schenectady, N.Y., 23 Jul. 1984
(Contract W-7405-eng-36)
(DE84-013891; LA-UR-84-1775; CONF-840755-1) Avail: NTIS HC A02/MF A01

The solution of simultaneous polynomial equations by the classical elimination algorithm is discussed. This algorithm is compared with more recent Newton and homotopy algorithms. The MACSYMA implementation of elimination theory is reviewed and its shortcomings are assessed. Directions for future work are discussed. DOE

N84-34212# Loughborough Univ. of Technology (England). Dept. of Mathematics.
ON SQUARE-FULL INTEGERS IN A SHORT INTERVAL
Nov. 1982 15 p refs
(MATHS-Res-170) Avail: NTIS HC A02/MF A01

Bateman-Grosswald's function (number of square-full integers not exceding x) on square-full integers is studied. Square-full integer is a positive integer n such that p squared divides n whenever p is a prime division of n. Properties on the Bateman-Grosswald's function are improved. Roth's method is used. Author (ESA)

N84-34213# Lanchester Polytechnic, Coventry (England).
A MULTIGRID FINITE ELEMENT METHOD
K. E. Barrett and D. M. Butterfield May 1983 27 p refs
Avail: NTIS HC A03/MF A01

The multigrid finite element method is discussed. Numerical experiments are performed on (linear and nonlinear) boundary value problems. Wesseling's algorithm and Sonneveld's technique are used. Author (ESA)

N84-34214# Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.
LOCAL AND GLOBAL EXISTENCE AND BEHAVIOR FOR T TENDS TO INFINITY NAVIER-STOKES EQUATIONS

Wolf vonWahl 1984 19 p refs Submitted for publication
(CTH-Math-1984-08; ISSN-0347-2809) Avail: NTIS HC A02/MF A01

A nonlinear evolution equation in a Banach space established by an analytical mapping and a positive operator which generates an analytic semigroup, is considered. These results are applied to the determination of velocity and pressure of a viscous imcompressible fluid under the influence of an external force, Navier-Stokes equation. Connection between weak solutions (turbulent solutions) and local strong solutions are discussed. Author (ESA)

N84-34215# Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.
MULTIPARAMETER MAXIMAL FUNCTIONS ALONG DILATION-INVARIANT HYPERSURFACES
Hasse Carlsson, Peter Sjoegren, and Jan-Olov Stroemberg 1984 19 p refs Submitted for publication
(CTH-Math-1984-11; ISSN-0347-2809) Avail: NTIS HC A02/MF A01

The maximal function operator associated to the equation of a hypersurface is defined. That this operator is bounded on L sup p spaces is proved. This boundedness is established by one-dimensional maximal functions. Methods for maximal function along curves, involving Fourier transformation and analytic interpolation are used. An analogous result for a quadratic surface is proved. Author (ESA)

N84-34216# Rome Univ. (Italy). Dipt. di Fisica.
CANONICAL COMMUTATION RELATIONS AND GAUSS' LAW IN THE TEMPORAL GAUGE
G. C. Rossi and M. Testa (Istituto Nazionale di Fisica Nucleare, Rome) 22 Jul. 1983 10 p refs Submitted for publication
(Preprint-360) Avail: NTIS HC A02/MF A01

It is shown that there are no contradictions in the equation of the canonical commutation relations which are satisfied by the set of states which are invariant under group of the local, time independent gauge transformation (of zero winding number) which go to identity of spatial infinity and their infinitesimal generators (Gauss law operators) of the larger space (which describes systems in presence of arbitrary external sources) spanned by eigenstates of the Hamiltonian. Convolution property of the Feynman propagation kernel and Faddeev-Popov's identity are utilized. An example from perturbation theory is considered. Author (ESA)

N84-34217# Rome Univ. (Italy). Dipt. di Fisica.
LOCAL AND GLOBAL INTEGRABILITY OF ANOMALOUS WARD IDENTITIES
G. C. Rossi, M. Testa (Istituto Nazionale di Fisica Nucleare, Rome), and K. Yoshida (Salerno Univ., Italy) 10 Sep. 1983 10 p refs Submitted for publication Sponsored by Ministerio della Pubblica Istruzione
(Preprint-364) Avail: NTIS HC A02/MF A01

Witten's quantization condition by directed integration of the Wess-Zumino functional differential equations, in the cases in which it is possible to choose continuous path on the one connected sub-space of all unitary unimodular matrices, is considered. Local and global integrability of Wess and Zumino equation for chiral SU(3)xSU(3) anomalous Ward identites are discussed. Theory of differential forms is applied to an infinite system of partial differential equations. Wess-Zumino methods and Witten's topological considerations establish identical structure of solutions. This method has the advantage that currents (axial and vector) need not be defined by trial and error and can be computed as functional derivatives. Author (ESA)

N84-34218# Rome Univ. (Italy). Dipt. di Fisica.
A REMARK ON THE KORTEWEG-DE VRIES EQUATION
F. Calogero 19 Mar. 1984 6 p refs Submitted for publication
(Preprint-403) Avail: NTIS HC A02/MF A01

The Korteweg de Vries (KdV) partial differential equation is studied. The KdV solutions u(x,t) are interpreted as the velocity of a medium moving in the X-direction. The KdV equation can be equivalent to the trivial linear equation. Results are restated when u(x,t)=V[Z(x,t)] with Z(x,t) satisfying an elementary partial differential equation. Author (ESA)

N84-34219# Rome Univ. (Italy). Dipt. di Fisica.
WEAK INTERACTIONS ON THE LATTICE
N. Cabibbo, G. Martinelli (Istituto Nazionale di Fisica Nucleare, Frascati, Italy), and R. Petronzio (CERN, Geneva, Switzerland) Nov. 1983 21 p refs Submitted for publication
(TH.3774-CERN; INFN-375) Avail: NTIS HC A02/MF A01

Lattice QCD to compute the value of matrix elements of four fermion (antisymmetric Kets) operators which are relevant for weak interactions, are studied. These methods are applied to the matrix element of four fermion operators between bosonic (Symmetric Kets) states by use of the quark propagators utilized for hadronic spectroscopy. Matrix elements between pseudoscalar states of effective weak Hamiltonian operators including short distance gluon effects are presented. Numerical results based on 14 link configurations in a 1000 x 20 lattice for the Wilson quark progagators are given. Analyses when the level of statistical fluctuation is acceptable with a small number of configurations are suggested. Relations between fermion operators and their continum limit are discussed. Author (ESA)

N84-34220# Barcelona Univ. (Spain). Seccio de Matematiques.
ON THE INTEGRALS OF THE n-BODY PROBLEM
Jaume Llibre 1984 17 p refs
Avail: NTIS HC A02/MF A01

The spatial n-body problem (n particles of positive masses moving in the d-dimensional space subject to Newton's gravitational (law) in a d-dimensional space is discussed. The spatial n-body problem with n > or = 4 cannot be any C sup 1 integral of a special kind other than the classical ones and the elimination of Jacobi's node. McGehee's method is utilized for the n-body problem where the singularity of total collision is blown up and its place is on an invariant total collision manifold. Author (ESA)

N84-34221# Barcelona Univ. (Spain). Facultat de Matematiques.
QUALITATIVE ANALYSIS OF THE ANISOTROPIC KEPLER PROBLEM Ph.D. Thesis
Josefina Casasayas and Jaume Llibre 20 Feb. 1984 122 p refs Submitted for publication
Avail: NTIS HC A06/MF A01

Qualitative analysis of the anisotropic Kepler problem (AKP) is given. Lacomba-Simo's method (Blow-up method) is utilized. Blow-up method replaces the singularity by an invariant boundary manifold and the systems extend over it. Collision manifold and the infinity manifold are defined. Recurrent motions on nonnegative energy levels are studied for use of symbolic dynamics with the symmetries. Geometry of symmetric periodic orbits with relation to the symmetries of AKP is discussed. Author (ESA)

N84-34222# National Academy of Sciences - National Research Council, Washington, D. C.
COMPUTATIONAL MODELING AND MATHEMATICS APPLIED TO THE PHYSICAL SCIENCES Final Report
Feb. 1984 105 p
(Contract DE-FG01-81ER-12001)
(PB84-180512) Avail: NTIS HC A06/MF A01 CSCL 12A

A matrix approach is used that views the same problem from three different standpoints. The traditional approach is taken of discussing a number of typical problems, (e.g., hydrodynamics, astronomy, meteorology) leading to computational modeling from the viewpoint of the scientific or engineering discipline in which they arise. The problems are then studied from the viewpoint of the computational and mathematical difficulties that arise in connection with them. For example, these difficulties may involve large numbers of degrees of freedom, different scales of time and length, or singularities of various types. The viewpoint then becomes that of the numerical algorithms involved in the computations, such as various discretization methods, continuation approaches, and splitting techniques. It is recommended that there be increased support for (1) computational modeling mathematics;

(2) computating facilities dedicated to computational modeling and applied mathematics and; (3) education and manpower development in computational and applied mathematics. GRA

N84-33938# Schlumberger-Doll Research, Ridgefield, Conn.
PROFILE INVERSION OF A PLANAR MEDIUM WITH A LINE SOURCE OR A POINT SOURCE
W. C. Chew and S. L. Chuan *In* ESA IGARSS 84. Remote Sensing: From Res. towards Operational Use, Vol. 1 Aug. 1984 p 509-511 refs (For primary document see N84-33857 23-43) Avail: NTIS HC A24/MF A01

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N84-34223# Princeton Univ., N. J. Dept. of Statistics.
ROBUST CONFIDENCE INTERVALS FOR A SCALE PARAMETER: A COMPROMISE BETWEEN THE GAUSSIAN AND THE SLASH Technical Report
Stephan Morgenthaler Sep. 1983 33 p
(Contracts DEAG29-82-K-0178; DA-AC02-81ER-10841)
(AD-A143666; TR-255-SER-2; ARO-19442.16-MA) Avail: NTIS HC A03/MF A01 CSCL 12/1

This report describes a small sample approach parallel to the one for a location parameter. Conditional confidence distribution for log(delta) = tau is derived and then discussed are the difficulties in compromising the Gaussian and the slash. Explored are both the strong and the bioptimal procedures. There is a difference between inference about location and inference about scale. Author (GRA)

N84-34224# TRADOC Systems Analysis Activity, White Sands Missile Range, N. Mex.
THE 2-ON-1 STOCHASTIC DUEL Final Report
A. V. Gafarian and C. J. Ancker, Jr. Dec. 1983 58 p
(AD-A143679; AD-F050098; TRASANA-TR-43-83) Avail: NTIS HC A04/MF A01 CSCL 12/1

The one-on-one stochastic duel is extended to the general two-on-one duel for the first time. The state equations, win probabilities, means value, and variance functions are derived. The case where one side has Erlang (2) firing times and the other is negative exponential is compared to the corresponding Stochastic Lanchester and Lanchester models to demonstrate their non-equivalence. GRA

N84-34225# California Univ., Berkeley. Electronics Research Lab.
RESEARCH ON SELF-GENERATED STOCHASTIC MOTION Final Report, 1 Jun. 1979 - 31 May 1984
A. J. Lichtenberg and M. A. Lieberman Jul. 1984 12 p
(Contract N00014-79-C-0674)
(AD-A144093) Avail: NTIS HC A02/MF A01 CSCL 12/1

Basic problems in statistical physics are treated, with particular emphasis given to self-generated stochasticity for dynamical motion in two or more degrees of freedom. The basic procedure is to apply the modern theory of the destruction of invariants, the transition to stochastic motion, and statistical descriptions of stochastic motion. The theory is compared with numerical experiments using mapping approximations, which are iterated for hundreds of thousands of mapping periods on high speed computers. Particular problems treated are the fine structure of phase space, effects of higher dimensionality including Arnold diffusion, modulational diffusion, and the interaction between extrinsic stochasticity and resonances. GRA

N84-34226# National Aerospace Lab., Amsterdam (Netherlands). Flight Div.
DETECTION-FILTER REPRESENTATIONS FOR MARKOV JUMP DIFFUSIONS
H. A. P. Blom 11 Mar. 1983 40 p refs
(NLR-TR-82019-U) Avail: NTIS HC A03/MF A01

Filtering for Gaussian observations of linear differential systems driven by both Wiener processes and marked Poisson point processes is considered. Representations were derived by decomposing the conditional density in a conditional density for the chain and a conditional density for the state of the differential system, given the state of the chain. The evolution of the conditional state of the chain resembles the evolution of Kailath's likelihood-ratio. The evolution for the conditional density of the state of the differential system is given by a set of interacting subfilters; one for each possible state of the chain. By neglecting the third order central moment associated with each subfilter in this representation, a finite dimensional detection filter is obtained. The reduced subfilters look Kalmanlike. This finite dimensional approximate filter is a Gaussian sum filter. Author (ESA)

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N84-34227# Cornell Univ., Ithaca, N.Y. School of Electrical Engineering.
DECENTRALIZED SYSTEM THEORY
T. Berger May 1984 12 p refs
(Contract DE-AC01-80RA-50419)
(DE84-013658; DOE/RA-50419/1) Avail: NTIS HC A02/MF A01

There are three results for the analysis of algorithms for efficient resolution of contentions in local area packet communication nets. An analysis of the Gallagher-Tsybakov-Ruget algorithm for the ternary feedback case was performed. Good estimates of the packet delay distribution mean and variance were derived by appropriately bounding the kernel of the integral equation for the function. A causal version of rate distortion was extended to incorporate causality conditions. For the multiple descriptions problem, new outer bounds on the achievable region were derived. The problem of encoding a discrete memoryless source was considered. Also considered is the LQG optimal control problem, assuming that observed data must be transmitted to the controller over an additive Gaussian noise channel with noiseless feedback. S.B.

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N84-34228# Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.
ON CHOW GROUPS OF CONIC BUNDLE SURFACES
Per Salberger 1984 20 p refs Submitted for publication
(CTH-Math-1984-12; ISSN-0347-2809) Avail: NTIS HC A02/MF A01

A characteristic map of the group of 0-dimensional cycles of degree zero module rational equivalence into the first cohomology's product group (conic bundle surface by algebraic closure of a perfect field) tensor product non zero members of algebric closure, is described. The characteristic map is related to a map of the norm group into a product of the norm groups corresponding to the points of a Severi-Braver k-curve where the quaternion K-algebra corresponding to the generic fiber ramifies. The characteristic map of the Chow group for tonic bundle surfaces is described. Author (ESA)

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N84-34229# Ohio State Univ., Columbus. Electroscience Lab.
APPROXIMATE METHODS FOR OBTAINING THE COMPLEX

NATURAL ELECTROMAGNETIC OSCILLATIONS OF AN OBJECT
T. C. Lee and D. L. Moffatt Feb. 1984 299 p
(Contract N00014-78-C-0049)
(AD-A143913; ESL-710816-16) Avail: NTIS HC A13/MF A01 CSCL 20/3

The complex natural resonances (poles) of an object are excitation (aspect and polarization) independent. The primary goal of this dissertation is to develop a rational function approximation (RFA) for use in pole extraction from the measured scattering spectrum data of broadband radar systems. Applications of the RFA are demonstrated for a variety of simple as well as complex objects. The results obtained are compared with those poles extracted using other methods. To overcome noise problems, two preprocessing techniques - a sum operator and a zero-phase-shift digital filter are developed. The minimum signal-to-noise ratio (additive) is explored such that reliable pole extraction is still feasible. Finally, RFA are applied to the measured data of complex geometric targets (scale models of aircraft). GRA

71 ACOUSTICS

Includes sound generation, transmission and attenuation. For noise pollution see *45 Environment Pollution.*

N84-34230*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
AN EXPERIMENTAL INVESTIGATION OF THE EFFECT OF BOUNDARY LAYER REFRACTION ON THE NOISE FROM A HIGH-SPEED PROPELLER
James H. Dittmar, Robert J. Burns, and Dennis J. Leciejewski Sep. 1984 31 p refs
(NASA-TM-83764; E-2257; NAS 1.15:83764) Avail: NTIS HC A03/MF A01 CSCL 20A

Models of supersonic propellers were previously tested for acoustics in the Lewis 8- by 6-Foot Wind Tunnel using pressure transducers mounted in the tunnel ceiling. The boundary layer on the tunnel ceiling is believed to refract some of the propeller noise away from the measurement transducers. Measurements were made on a plate installed in the wind tunnel which had a thinner boundary layer than the ceiling boundary layer. The plate was installed in two locations for comparison with tunnel ceiling noise data and with fuselage data taken on the NASA Dryden Jetstar airplane. Analysis of the data indicates that the refraction increases with: increasing boundary layer thickness; increasing free stream Mach number; increasing frequency; and decreasing sound radiation angle (toward the inlet axis). At aft radiation angles greater than about 100 deg there was little or no refraction. Comparisons with the airplane data indicated that not only is the boundary layer thickness important but also the shape of the velocity profile. Comparisons with an existing two-dimensional theory, using an idealized shear layer to approximate the boundary layer, showed that the theory and data had the same trends. Analysis of the data taken in the tunnel at two different distances from the propeller indicates a decay with distance in the wind tunnel at high Mach numbers but the decay at low Mach numbers is not as clear.
Author

N84-34231*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A THEORETICAL MODEL FOR THE CROSS SPECTRA BETWEEN PRESSURE AND TEMPERATURE DOWNSTREAM OF A COMBUSTOR
J. H. Miles and E. A. Krejsa 1984 61 p refs Presented at the 107th Meeting of the Acoustical Society of America, Norfolk, Vir., 6-10 May 1984
(NASA-TM-83671; E-2114; NAS 1.15:83671) Avail: NTIS HC A04/MF A01 CSCL 20A

A theoretical model developed to calculate pressure-temperature cross spectra, pressure spectra, temperature spectra and pressure cross spectra in a ducted combustion system is presented. The model assumes the presence of a fluctuating-volumetric-heat-release-rate disk source and takes into account the spatial distribution of the steady-state volumetric-heat flux. Using the model, pressure, velocity, and temperature perturbation relationships can be obtained. The theoretical results show that, at a given air mass flow rate, the calculated pressure-temperature cross spectra phase angle at the combustor exit depends on the model selected for the steady-state volumetric-heat flux in the combustor. Using measurements of the phase angle, an appropriate source region model was selected. The model calculations are compared with the data. The comparison shows good agreement and indicates that with the use of this model the pressure-temperature cross spectra measurements provide useful information on the physical mechanisms active at the combustion noise source.
Author

N84-34232# Naval Postgraduate School, Monterey, Calif.
A COMPARISON OF IMPEDANCE MEASUREMENT TECHNIQUES IN AIR M.S. Thesis
J. T. Mason Mar. 1984 92 p
(AD-A143638) Avail: NTIS HC A05/MF A01 CSCL 20/1

The acoustic impedance of several Helmholtz resonators were measured using two different techniques. The first technique employed the conventional Standing Wave Tube method. The second was the Dual-Microphone Transfer Function of J. Y. Chung and D. A. Blaser. The calculability of the frequency dependent Helmholtz resonator impedance allowed the methods to be compared for both absolute accuracy and relative precision. The average relative precision for the SWT technique was 4.2% while the average for the dual-microphone technique was 18.4%.
Author (GRA)

N84-34233# Department of the Air Force, Washington, D.C.
BULK ACOUSTIC RESONATOR TRACKING FILTER Patent Application
M. S. Buchalter, inventor (to Air Force) Filed 30 May 1984 16 p
(AD-D011159; US-Patent-Appl-SN-615502) Avail: NTIS HC A02/MF A01 CSCL 20/1

This invention is directed to a narrow band filter for eliminating out-of-band noise in the oscillator signal of a Doppler radar system. It provides a very high Q filter derived from a Bulk Acoustic Resonator's (BAR) high Q, L-Band response and uses thermal feedback to lock the BAR's response band onto the input frequency. The BAR is a very narrow band filter with a Q near 40,000 and a comblike frequency response having passbands occurring every 5 MHz, approximately. The comblike response of the BAR shifts down 60 KHz for every 1 c rise in temperature. In this invention a frequency sensitive heater is used to move the response comb of the BAR up or down in accordance with changes in the frequency of the incoming signal. The input frequency can be allowed to drift and the heat source will produce more heat or less heat, keeping the response right at the input frequency.
Author (GRA)

N84-34234# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
THE EFFECT OF AIRCRAFT WITH NOISE CERTIFICATES ACCORDING TO CLASS ICAO ANNEX 16 ON THE DETERMINATION OF NOISE PROTECTION DOMAINS FOLLOWING THE LAW ON PROTECTION AGAINST AIRCRAFT NOISE [ZUR BERUECKSICHTIGUNG VON FLUGZEUGEN MIT LAERMZULASSUNG NACH ICAO ANNEX 16 BEI DER ERMITTLLUNG VON LAERMSCHUTZBEREICHEN NACH DEM GESETZ SCHUTZ GEGEN FLUGLAERM]
U. Isermann, K. Matschat, and E. A. Mueller Dec. 1983 16 p In GERMAN Presented at 13th DGLR-Fachausschusses Stroemungskustik/Fluglaerm, Goettingen, West Germany, 18 Nov. 1983
(MPIS-117/1983) Avail: NTIS HC A02/MF A01

A proposal of the German Federal Ministry of the Environment to adapt the calculation method for noise domains to the expected future air traffic situation is explained. It is explained how

the equivalent continuous noise level (L(eq)) is calculated as a function of the different parameters. The new division in aircraft groups is presented. The accuracy of the L(eq) prediction depends on the accuracy of the air traffic prognosis. Comparison between calculated and measured values shows differences from 0 to 0.4 dB at an airport, and from 1.5 to 3 dB at distant measuring points. Author (ESA)

N84-33711# Tohoku Univ., Sendai (Japan).
THE LOUDNESS OF COMPLEX NOISE CONSISTED OF IMPACT SOUND AND STEADY NOISE
Yoiti Suzuki, Masazumi Kumagai, Yoshiaki Inaba, and Toshio Sone *In its* The Record of Elec. and Commun. Eng. Conversazione, Vol. 52, No. 3, Feb. 1984 Feb. 1984 p 101-112 refs In JAPANESE; ENGLISH summary (For primary document see N84-33707 23-33)
Avail: NTIS HC A04/MF A01

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N84-34235# Naval Research Lab., Washington, D. C.
STABILITY OF LAMINAR ELECTRON LAYERS Interim Report
D. Chernin and Y. Y. Lau 22 Jun. 1984 54 p
(DA Proj. R01-109)
(AD-A143788; AD-E000580; NRL-MR-5358) Avail: NTIS HC A04/MF A01 CSCL 20/8

The stability of a finite thickness, laminar cylindrical shell of electrons rotating azimuthally and enclosed in a coaxial waveguide is considered. The equilibrium rotation of the electrons is supported either by a radial electric field, an axial magnetic field, or a combination of both. The stability problem is formulated exactly as an eigenvalue problem, including all relativistic and electromagnetic effects as well as all effects of self and applied equilibrium fields. An approximate dispersion relation, valid for thin beams, is obtained analytically and the classical results for the longitudinal modes, i.e., the negative mass, cyclotron maser and diocotron instabilities and for the transvers mode are recovered in appropriate limits. The dispersion relation is relatively simple and is valid for arbitrary values of the equilibrium electric and magnetic fields and for arbitrary bean energy. It therefore provides a ready comparison of the small signal properties of such devices as the Astron, gyrotron, orbitron, heliotron and the various cross field devices. It may also be of interest in accelerator and space physics applications. Some heretofore unnoticed effects on beam stability of equilibrium fields are reported; one such effect in particular leads to formulation of a simple, effective method either to maximize or eliminate altogether the longitudinal mode growth. Results from the dispersion relation compare favorably to results obtained from a numerical solution of the eigenvalue problem. GRA

N84-34236# California Inst. of Tech., Pasadena. Lab. of Chemical Physics.
A SIMPLE DWBA (FRANCK-CONDON) TREATMENT OF H--ATOM TRANSFERS BETWEEN TWO HEAVY PARTICLES
R. A. Marcus 2 Jul. 1984 29 p
(Contract N00014-79-C-0009)
(AD-A143867; TR-15) Avail: NTIS HC A03/MF A01 CSCL 20/8

A simple DWBA (Franck-Condon) method for calculating the probability of transferring a light particle between two heavy ones in a collinear collision at energies below and around the reaction threshold is presented. The region is the important one for the thermal reaction rates. The method is tested for two different model LEPS surfaces for H-atom transfer with moderately high barriers. The results are in good agreement with those of accurate multi-channel calculations. The transition probability is calculated as an overlap integral over the reactants' and products' wavefunctions and the interaction potential. The reactants' and products' wavefunctions are calculated from their respective distortion potentials as one-term adiabatically separable approximations. Both the distortion potentials and the interaction potentials are extracted straightforwardly from the LEPS surface. The novel feature of the approach is that for the first time accurate results for the absolute values of the reaction probability are obtained from a simple overlap of single-channel approximate wavefunctions obtained directly from the respective parts of the potential energy surface for the reaction. Author

N84-34237# Naval Research Lab., Washington, D. C. Lab. for the Structure of Matter.
THE STRUCTURAL CHEMISTRY OF ENERGETIC COMPOUNDS Annual Report, 1 Jan. - 31 Dec. 1983
R. Gilardi, C. George, and J. Karle 6 Jul. 1984 40 p
(NR Proj. 093-069; RR0-240201)
(AD-A143955; LSM-84-1) Avail: NTIS HC A03/MF A01 CSCL 07/4

This report summarizes the investigation of the molecular structure of a number of energetic materials or their precursors which are potentially useful in explosive or propellant formulation. The aims of this research are to determine or corroborate the exact chemical structure of newly developed materials, and to develop a library of structural parameters for groups occurring in energetic compounds. These structural parameters provide a basis for computationally modelling proposed target compounds by means of quantum chemistry and conformational energy analysis. Specific application is made in this report to the energy analyses of two proposed polynitro cage compounds, octanitrocubane and 2,4,6,8,9,10-hexanitro hexa-aza-adamantane. Author (GRA)

N84-34238# Hebrew Univ., Jerusalem (Israel). Dept. of Physical Chemistry.
ELECTRONIC EXCITATION IN MOLECULAR COLLISIONS: STRUCTURAL, DYNAMIC AND KINETIC CONSIDERATIONS Final Report, Sep. 1978 - Dec. 1983
R. D. Levine Aug. 1984 10 p
(Contract N00014-78-G-0036)
(AD-A143956) Avail: NTIS HC A02/MF A01 CSCL 07/4

The factors governing chemical reactivity with special reference to the role of electronic energy in promoting the reaction and to the production of electronically excited species are examined. The problem is studied both in general terms (i.e., the development of the required theoretical framework) and in application to specific systems. Author (GRA)

N84-34239# Armed Forces Radiobiology Research Inst., Bethesda, Md.
LINAC FACILITY AT ARMED FORCES RADIOBIOLOGY RESEARCH INSTITUTE
M. T. Gee May 1984 13 p
(AD-A143970; AFRRI-TR-84-3) Avail: NTIS HC A02/MF A01 CSCL 06/18

The Armed Forces Radiobiology Research Institute LINAC is a traveling microwave type high-energy linear electron accelerator, which accelerates electrons to sufficient energies and in sufficient quantities to provide radiation fields of interest for radiobiological, radiochemical, and materials/component research. It provides radiation researchers with a source of high-energy electron or high-energy bremsstrahlung (X-ray) radiation. This report gives details on the LINAC's design, operation, and capabilities. Author (GRA)

N84-34240# Maryland Univ., College Park. Dept. of Physics and Astronomy.
NEW METHOD IN ELEMENTARY PARTICLE DETECTION Final Report
J. Weber 30 Jun. 1984 45 p
(Contract F49620-83-C-0095; ARPA Order 4099)
(AD-A144057; AFOSR-84-0619TR) Avail: NTIS HC A03/MF A01 CSCL 20/8

Theory is given for momentum transfer to an ensemble of particles by incident neutrinos or antineutrinos, in such a way that subsequent measurements cannot reveal the detailed characteristics of this transfer. It is shown that large scattering cross sections

may be obtained, proportional to the square of the number of scatterers. Experiments are described for observations at energies of about 12 kilovolts and in the one million electron volt region. GRA

N84-34241# Los Alamos Scientific Lab., N. Mex.
COMPTON SCATTERING OF PHOTONS FROM ELECTRONS IN THERMAL (MAXWELLIAN) MOTION: ELECTRON HEATING
Joseph J. Devaney Apr. 1984 50 p refs
(Contract W-7405-eng-36)
(DE84-013860; LA-10065-MS) Avail: NTIS HC A03/MF A01

The Compton differential scattering of photons from a relativistic Maxwell distribution of electrons is reviewed. The exact theory and the approximate theories were verified for application to particle transport codes. It is found that the ordinary zero temperature Klein-Nishina formula can be used up to electron temperatures of 10 keV if errors of less than 1.6% in the total cross section and of about 5% or less in the differential cross section can be tolerated. For photons below 1 MeV and temperatures below 100 keV the Wienke-Lathrop isotropic approximation is recommended. An approximate, simple, accurate, total cross section as a function of photon energy and electron temperature is presented. DOE

N84-34242# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
DYNAMIC RESONANCES IN THE REACTION OF FLUORINE ATOMS WITH HYDROGEN MOLECULES
D. M. Neumark, A. M. Wodtke, G. N. Robinson, C. C. Hayden, and Y. T. Lee May 1984 18 p refs Presented at the 187th Natl. Meeting of the American Chemical Society, St. Louis, 8-12 Apr. 1984
(Contract DE-AC03-76SF-00098)
(DE84-013240; LBL-17822; CONF-840415-24) Avail: NTIS HC A02/MF A01

The reactions of F + H2, HD and D2 were studied in high resolution crossed molecular beams experiments. Center of mass translational energy and angular distributions were determined for each product vibrational state. In the F + H2 reaction, the v = 3 product showed intense forward scattering while the v = 2 product was backward peaked. The results suggest that dynamical resonances play an important role in the reaction dynamics of this system. In the F + HD reaction, the strong forward scattering of HF products and backward scattering of DF products is in agreement with the prediction of a stronger resonance effect for HF formation. The effect of the H2 rotational excitation and the reactivity of F((2)P/sub 1/2/) are also discussed. DOE

N84-34243# Department of Energy, Washington, D. C.
THREE CHAMBER NEGATIVE ION SOURCE Patent Application
Ka-Ngo Leung, Kenneth W. Ehlers, and John R. Hiskes, inventors (to DOE) Filed 10 Nov. 1983 42 p
(Contracts W-7405-eng-48; DE-AC03-76SF-00098)
(DE84-014505; US-Patent-Appl-SN-550701) Avail: NTIS HC A03/MF A01

The objective is to provide a negative ion source which efficiently provides a large flux of negatively ionized particles. This invention provides a volume source of negative ions which has a current density sufficient for magnetic fusion applications and has electrons suppressed from the output. A second objective is to provide a volume source of negative ions which can be electrostatically accelerated to high energies and subsequently neutralized to form a high energy neutral beam for use with a magnetically confined plasma. DOE

N84-34244# Department of Energy, Washington, D. C.
ION SOURCE WITH IMPROVED PRIMARY ARC COLLIMATION Patent Application
William K. Dagenhart, inventor (to DOE) Filed 16 Dec. 1983 16 p
(Contract DE-AC05-84OS-21400)
(DE84-014359; US-Patent-Appl-SN-562147) Avail: NTIS HC A02/MF A01

An improved negative ion source is provided in which a self-biasing, molybdenum collimator is used to define the primary electron stream arc discharge from a filament operated at a negative potential. The collimator is located between the anode and the filament. It is electrically connected to the anode by means of an appropriate size resistor such that the collimator is biased at essentially the filament voltage during operation. Initially, the full arc voltage appears across the filament to collimator until the arc discharge strikes. Then the collimator biases itself to essentially filament potential due to current flow through the resistor thus defining the primary electron stream without intercepting any appreciable arc power. The collimator aperture is slightly smaller than the anode aperture to shield the anode from the arc power which, in the past, has caused overheating and erosion of the anode collimator during extended time pulsed-beam operation of the source. With the self-biasing collimator of this invention, the ion source may be operated from short pulse periods to steady-state without destroying the anode. DOE

N84-34245# Argonne National Lab., Ill.
PROSPECT OF POLARIZED TARGETS IN ELECTRON RINGS
R. J. Holt 1984 11 p refs Presented at the Conf. on the Intersect. between Particle and Nucl. Phys., Steamboat Springs, Colo., 23 May 1984
(Contract W-31-109-eng-38)
(DE84-014684; CONF-8405193-21) Avail: NTIS HC A02/MF A01

The feasibility of performing electron scattering experiments with polarized targets in electron storage rings is discussed. Three examples of the physics which is accessible with this method are given. It is noted that this method is compatible with other proposals for linac-stretcher-ring accelerator designs. A method for producing a polarized hydrogen or deuterium target is proposed and some preliminary results are described. A brief summary of laser-driven polarized targets as well as conventionally produced polarized atomic beams is included. DOE

N84-34246# Rome Univ. (Italy). Dipt. di Fisica.
SEARCH FOR EXCITED QUARKS
A. DeRujula (CERN, Geneva), L. Maiani, and R. Petronzio Dec. 1983 16 p refs
(Preprint-383; TH.3779-CERN) Avail: NTIS HC A02/MF A01

It is argued that starks of mass < or = sq root s/4 can be copiously produced at a hadron collider. The stark search in jet-jet invariant mass distributions is limited by resolution, but not by yield. In a jet-photon invariant mass plot, the contrary is the case. Very small background, and considerable signals are expected in stark searches via three-jet versus two-jet invariant mass plots. In similar plots for events wherein a jet is substituted for a photon, starks would produce scarcer but even more striking signals. Author (ESA)

N84-34247# Rome Univ. (Italy). Dipt. di Fisica.
TESTING THE SIX QUARK SHEME
M. Lusignoli and A. Pugliese 19 Mar. 1984 20 p refs Submitted for publication
(Preprint-402) Avail: NTIS HC A02/MF A01

Data on decays of particles carrying beauty are used, together with data on CP conserving and CP violating weak processes, to restrict the range of allowed values for the parameters in the quark mixing matrix. It is predicted that if the top quark mass is low (33GeV) decay will be seen, but mixing will be small. Author (ESA)

N84-34248# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
STUDY OF THE CONTRIBUTIONS OF CHEMICAL AND VAN DER WAAL FORCES TO INTERACTION BETWEEN FLUORINE AND Ar, Kr AND Xe, USING MOLECULAR BEAM SCATTERING INVESTIGATIONS OF INTEGRAL SCATTERING CROSS SECTIONS Thesis [UNTERSUCHUNG DER BEITRAEGE CHEMISCHER UND VAN-DER WAALS KRAEFTE AUF DIE WECHSELWIRKUNG VON FLUOR-ATOMEN MIT AR, KR UND

XE AUS MOLEKULARSTRAHLSTREUUNTERSUCHUNGEN INTEGRALER STREUQUERSCHNITTE]
Klaus Mueller Feb. 1984 185 p refs In GERMAN
(MPIS-1/1984; ISSN-0436-1199) Avail: NTIS HC A09/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 30,40

Molecular beam scattering experiments were developed to investigate the interaction between F-atoms and noble gas atoms. The phenomena occurring during elastic scattering in the thermal energy domain are explained by the example F-Xe. A comparison with experiments described in the literature led to a measurement method to determine the velocity dependence of integral scattering cross sections of the systems F-Ar, F-Kr, and F-Xe in the energy domain between 3 and 160 meV, with high accuracy. The measurements show well resolved oscillation structures. The measurements were evaluated with model calculations using the elastic approximation and the Hund'she coupling case C, and compared with other spectroscopic investigations and potential calculations. The van der Waals and chemical binding character of the different molecular state is determined. Author (ESA)

N84-34249# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
ENERGY TRANSFER IN ATOM-MOLECULE COLLISIONS WITH SUPRATHERMAL COLLISION ENERGY Thesis [ENERGIETRANSFER BEI ATOM-MOLEKUELSTOESSENUEBERTHERMISCHER STOSSENERGIE]
D. Otten Feb. 1984 108 p refs In GERMAN
(MPIS-2/1984; ISSN-0436-1199) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 19,50

Inelastic scattering processes in the systems Xe-CO2, CF2Cl2-Ar, and CF2Cl2-Ne were investigated by the time of flight method. The gases Xe and CF2Cl2 were seeded with 2% to 12% H2 and expanded under high pressure to obtain high energy beam velocities. The molecular beam apparatus is described. The experiments determine rotational and vibrational excitation of the molecules. In the system Xe-CO2 a distinct structure is measured in the energy loss spectra with collision energies between 0.2 and 1.6 eV. For the systems CF2Cl2-Ar and -Ne energy loss distributions are measured at 0.55 and 0.34 eV, and very energy transfers, up to 100% of the collision energy, are observed. Besides a strong rotational excitation, a part of this energy is found in vibrational excitation of the molecule. Author (ESA)

N84-34250# National Inst. voor Kernfysica en Hoge Energieysica, Amsterdam (Netherlands).
[ACTIVITIES IN NUCLEAR AND HIGH ENERGY PHYSICS] Annual Report, 1983
1983 12 p In DUTCH
Avail: NTIS HC A02/MF A01

The carriers of weak interactions, the W and Z-bosons, were found at CERN. The construction of instrumentation for the large detectors of the large electron position ring at CERN was started. A radiochemistry laboratory was inaugurated. Work on radiation and lines muon chambers continued. Author (ESA)

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation.*

N84-34251# Pacific Northwest Lab., Richland, Wash.
A GUIDE FOR DISPOSITION OF RADIOACTIVE MATERIAL SOURCES
J. M. Taylor and J. M. Selby Apr. 1983 61 p refs Original contains color illustrations
(Contract DE-AC06-76RL-01830)
(DOE/EP-0088) Avail: NTIS HC A04/MF A01

The steps and requirements necessary to dispose of unwanted radioactive material sources are enumerated. The steps include obtaining approvals, radioactive source characterization, source disposition, packaging requirements, and shipment preparation. A flow chart of the necessary sequential steps of radioactive source disposition is provided. Author

N84-34252# Maxwell Labs., Inc., San Diego, Calif.
HIGH-CURRENT BETATRON, PHASE 1 Final Report, 22 Sep. 1980 - 15 Feb. 1982
G. Barak, D. Chernon, A. Fisher, H. Ishizuka, and N. Rostoker 16 Apr. 1982 77 p Prepared in cooperation with California Univ., Irvine
(Contract N00014-80-C-0914)
(AD-A143748; AD-E001397; MLR-1259) Avail: NTIS HC A05/MF A01 CSCL 20/7

In a conventional betatron, space charge limits the electron current during injection. By adding a toroidal magnetic field and injecting electrons with the inductive charging method we expect to increase the current limit by a factor of 10 to the 4th power to 10 to the 6th power. After the beam has been accelerated to high energy the torodial field is no longer necessary and can be reduced to facilitate extraction of the beam. The effect of toroidal magnetic field on space charge instabilities is investigated. An experimental betatron has been constructed with a major radius of 40 cm and a minor radius of 5 cm. On the basis of previous experimental results with inductive charging the current limit should be a few kilo amperes. GRA

74 OPTICS

Includes light phenomena.

N84-34253*# Illinois Univ., Urbana. Electro-Optic Systems Lab.
TIMING PERFORMANCE OF PHASED-LOCKED LOOPS IN OPTICAL PULSE POSITION MODULATION COMMUNICATION SYSTEMS
D. A. Lafaw and C. S. Gardner Aug. 1984 107 p refs
(Grant NsG-5049)
(NASA-CR-173970; NAS 1.26:173970; EOSL-Publ-84-001) Avail: NTIS HC A06/MF A01 CSCL 20F

An optical digital communication system requires that an accurate clock signal be available at the receiver for proper synchronization with the transmitted signal. Phase synchronization is especially critical in M-ary pulse position modulation (PPM) systems where the optimum decision scheme is an energy detector which compares the energy in each of M time slots to decide which of M possible words was sent. Timing errors cause energy spillover into adjacent time slots (a form of intersymbol interference) so that only a portion of the signal energy may be attributed to the correct time slot. This effect decreases the effective signal, increases the effective noise, and increases the probability of error. A timing subsystem for a satellite-to-satellite optical PPM communication link is simulated. The receiver employs direct photodetection, preprocessing of the detected signal, and a phase-locked loop for timing synchronization. The variance of the relative phase error is examined under varying signal strength conditions as an indication of loop performance, and simulation results are compared to theoretical calculations. Author

N84-34254# IBM Research Lab., San Jose, Calif.
SECOND HARMONIC GENERATION AT THIN FILM SILVER ELECTRODES VIA SURFACE POLARITONS
R. M. Corn, M. Romagnoli, M. D. Levenson, and M. R. Philpott Jul. 1984 27 p
(Contract N00014-82-C-0583)
(AD-A143597; TR-4) Avail: NTIS HC A03/MF A01 CSCL 20/6

The generation of second harmonic light from a silver-mica capacitor and from thin silver electrodes provides information on the charge and composition of the metal-dielectric interface. The second harmonic light is created by the injection of surface polaritons onto the electrode surface via prism coupling techniques. A theory relating the second harmonic intensity to the square of

the charge on the electrode successfully predicts the dependence of the SHG (Second Harmonic Generation) on applied voltage or potential and the time dependence of the SHG in response to a potential step. The time dependent second harmonic signal is also used to monitor the growth of a lead monolayer onto the silver electrode in the region of underpotential deposition. GRA

N84-34255# L'Garde, Inc., Newport Beach, Calif.
HIGHLY ACCURATE INFLATABLE REFLECTORS Final Report, 30 Sep. 1983 - 29 Feb. 1984
G. Veal and M. Thomas Edwards AFB, Calif. Air Force Rocket Propulsion Lab. May 1984 40 p
(Contract F04611-83-C-0052)
(AD-A143628; AFRPL-TR-84-021) Avail: NTIS HC A03/MF A01 CSCL 20/6

Analytic and experimental studies were performed to see if inflatable reflectors could be made with rms surface errors of less than 0.1 mm (a 1.0 mm capability had already been demonstrated). Surveys of film vendors resulted in the selection of several approaches including heat forming, laser-welding of gores, prestretching of gores, and gore reinforcement. Results show that inaccuracies less than 0.1 mm rms are feasible. The preferred approaches require heat forming, use of thick films and improved accuracy of flat pattern calculation. GRA

N84-34256# Universal Energy Systems, Inc., Dayton, Ohio.
A MODEL OF THE PERFORMANCE CHARACTERISTICS OF SILICON-GALLIUM INFRARED DETECTORS FOR LOW BACKGROUND APPLICATIONS Interim Report, 1 Sep. 1981 - 31 Mar. 1984
S. McGuigan, F. Szmulowicz (Dayton Univ.), and P. M. Hemenger (AFWAL, Wright-Patterson AFB, Ohio) Wright-Patterson AFB, Ohio AFWAL Apr. 1984 36 p
(Contracts F33615-82-C-5001; F33615-81-C-5095)
(AD-A143932; AFWAL-TR-84-4035) Avail: NTIS HC A03/MF A01 CSCL 17/5

The Si:Ga system is modeled for detection of infrared (IR) radiation in low backgrounds. The responsivity and detectivity are calculated as functions of residual B, compensation ratio, and temperature. The results demonstrate a large potential for improvement in device performance if starting material with a low residual B is used to manufacture the detectors. These improvements include higher responsivity, higher operating temperature, increased detectivity, greater uniformity in spatial response, and increased radiation hardness. GRA

N84-34257# California Univ., Los Angeles. Dept. of Physics.
CHARACTERIZATION OF INFRARED OPTICAL PROPERTIES OF TRANSPARENT MATERIALS Annual Scientific Report, 1 Apr. 1983 - 31 Mar. 1984
Rubin Braunstein 15 May 1984 34 p
(Grant AF-AFOSR-0169-83)
(AD-A143988; AFOSR-84-0605TR) Avail: NTIS HC A03/MF A01 CSCL 20/6

The techniques of deep level derivative absorption spectroscopy (DLDAS), photoinduced-transients-spectroscopy (P.I.T.S.) were employed to study deep levels and interfaces in Ga As. Optical transitions due to impurities and structural imperfections where observed by (DLDAS) which can be correlated with levels observed by (P.I.I.S.). Raman measurements were used to study changes in the surface depletion layer width of Ga As as a result of oxidizing and reducing plasma treatments; in addition, the local strain in Ga As due to various thicknesses of silicon nitride were studied by observing the shift of the LO phonon frequency. Author (GRA)

N84-34258# Stanford Univ., Calif. Information Systems Lab.
OPTICAL COMPUTING RESEARCH Annual Technical Report, 18 Mar. 1983 - 17 May 1984
Joseph W. Goodman, Moshe Nazarathy, Qizhi Cao, Raymond Kostuk, Ellen Ochoa, and Rae-Hong Park Jun. 1984 40 p
(Grant AF-AFOSR-0166-83)
(AD-A143994; SU-ISL-L722-9; AFOSR-84-0632TR) Avail: NTIS HC A03/MF A01 CSCL 20/6

This document covers work on several different areas of optical computing, as well as some work on digital processing of images. The primary emphasis of the work is on applications of optics to interconnections in the area of microelectronics. Other areas include diagonalization and inversion of circulant matrices, inversion of wavefronts using photorefractive crystals, suppression of speckle in coherently formed images, and data processing using dispersive anisotropic crystals. Author (GRA)

N84-34259# Texas Technological Univ., Lubbock. Optical Systems Lab.
SPACE-VARIANT OPTICAL SYSTEMS Annual Technical Report, 30 Sep. 1982 - 30 Sep. 1983
John F. Walkup and Thomas F. Krile Nov. 1983 15 p
(Grant AF-AFOSR-0076-79)
(AD-A143996; AFOSR-84-0609TR) Avail: NTIS HC A02/MF A01 CSCL 20/6

Both analytical and experimental investigations of 2-D space-variant optical processing techniques have been conducted. The investigations have included (1) the fabrication and quality testing of binary phase masks for multiplex holography; (2) a study of various techniques for using 1-D processors to perform 2-D processing and (3) a study of techniques for space-variant numerical optical processing. Author (GRA)

N84-34260# Department of the Air Force, Washington, D.C.
BROADBAND GUIDED-WAVE OPTICAL FREQUENCY TRANSLATOR USING AN ELECTRO-OPTICAL BRAGG ARRAY Patent Application
R. H. Kingston, inventor (to Air Force) Filed 30 Apr. 1984 20 p
(AD-D011164; US-Patent-Appl-SN-604508) Avail: NTIS HC A02/MF A01 CSCL 20/6

An optical frequency translator which utilizes Bragg diffraction for a travelling index wave produced by an array of interdigitated electrode fingers on a thin optical guided-wave structure. An interdigitated grating is driven by at least a three-phase electrical signal that results in a unidirectional wave with a fixed Bragg angle determined by electrode spacing. The diffraction produces a single-sideband suppressed carrier optical output. Author (GRA)

N84-34261# Department of the Air Force, Washington, D.C.
OPTICAL FLIP-FLOP SYSTEM Patent Application
J. L. Jewell, inventor (to Air Force) Filed 31 May 1984 23 p
(AD-D011165; US-Patent-Appl-SN-615612) Avail: NTIS HC A02/MF A01 CSCL 09/1

Document describes an optical flip-flop system having a pair of optically aligned nonlinear Fabry-Perot etalons, one of which acting as a bistable optical device, the other acting as a negative optical gate. The negative optical gate is initially tuned for high transmission and will remain transmissive until impinged upon by a first optical pulse, at which time it will momentarily become nontransmissive. If this nontransmissive state is longer than the recovery time of the bistable optical device, then the bistable optical device will become nontransmissive. The bistable optical device will remain nontransmissive until impinged upon by a second optical pulse. Thereupon, the bistable optical device will remain transmissive until such time the negative optical gate becomes nontransmissive again. In this manner the flip-flop system can be readily controlled by the application of the pair of optical pulses thereto. Author (GRA)

N84-34262# Standard Elektrik Lorenz A.G., Nuremburg (West Germany).
RESEARCH ON THE USE OF METAL-ORGANIC COMPOUNDS AS PHOTOCONDUCTORS IN ELECTROPHOTOGRAPHY Final Report, Jan. 1982
Armin Baumgaertner, Peter Kersten, Klaus Petrikat, and Max Ellinger (Bayreuth Univ.) Bonn Bundesministerium fuer Forschung und Technologie Jun. 1984 102 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-112; ISSN-0340-7608) Avail: NTIS

HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 21,50

Metal-organic systems based on ferrocene for electrophotographic application were developed. They can be integrated in a two or one-layer system. The following systems have sufficient electrophotographic properties as well as thermal and mechanical stability: vinylferrocene-styrene-acrylate-coplymer/SeTe and diphenylferrocenylamine in polystyrene/SeTe (two layers); CdS/vinylferrocene-styrene-acrylate copolymer (one layer).

Author (ESA)

N84-34263# Zeiss (Carl), Oberkochen (West Germany).
DEVELOPMENT OF A 60 CM PHOTOGRAPHIC ZENITH TELESCOPE, AND CONSTRUCTION OF A PROTOTYPE Final Report, Sep. 1980
Peter Henneberg, Christoph Kuehne, Dieter Reinhardt, and Alois Vogt Bonn Bundesministerium fuer Forschung und Technologie Jun. 1984 48 p ref In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-122; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 10

A photographic zenith telescope with a coma-free mirror system (Schmidt mirrors) and a zenith mirror to replace the mercury horizon was built. Apart from conventional photographic recording, the instrument permits the use of a multiplier and oscillating diaphragm for computer controlled operation with electronic measured date acquisition; both can be connected to a high efficiency data processing system. Author (ESA)

N84-34264# Berthold (H.) A.G., Berlin (West Germany).
DEVELOPMENT OF OPTOMECHANICAL DEFLECTORS FOR LIGHT BEAMS AND ELECTRONICAL-OPTICAL DEFLECTORS WITH SUBSEQUENT GENERATION OF LIGHT TO REPRESENT CHARACTERS DIGITALLY OR PARTIALLY Final Report, Mar. 1982
Rainer Maroske Bonn Bundesministerium fuer Forschung und Technologie Jun. 1984 62 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-140; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 13

Optomechanical typesetters with stationary type founts and optoelectronic deflectors with analog or digital character generation were developed and tested for phototypesetting. Cathode ray tubes or lasers are found to be suitable as exposure sources. For electrophotography, development with liquid toner and ZnO as conducting layer is used. Optomechanical deflectors with analog character generation and a rotating disk as illumination principle are too complicated. For electronic-optical deflectors with digital character generation, digitizing is qualitatively improved using the contour method. The first tests with laser or cathode ray tube typesetting systems in connection with electrophotography to produce hard copies as output show great difficulties.

Author (ESA)

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.

For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N84-34265 Polish Academy of Sciences, Warsaw.
GREEN'S FUNCTION FOR A PLANE WAVEGUIDE FORMULATED WITH ELECTRONIC PLASMA [FUNKCJA GREENA DLA PLASKIEGO FALOWODU WYPELNIONEGO PLAZMA ELEKTRONOWA]
Anna Brahmner-Kacprzynska 1982 18 p refs In POLISH
(ISSN-0208-5658) Copyright. Avail: Issuing Activity

Green's function is constructed as a source located in dispersion (electronic) plasma restricted by two perfectly conducting planes. Plasma is the dispersion source in which the space-time rays method is used for asymptotic field analysis. A hybrid ray-mode formulation of wave conductance in a structure with a dispersion center is developed. The possibility of representing Green's function in a hybrid form on the basis of solely geometrical relations for space-time rays is useful in more complex problems involving heterogeneous centers and objects scattered within a waveguide.

Author

N84-34266*# National Aeronautics and Space Administration, Washington, D. C.
EXPERIMENTAL RESEARCH ON ELECTRIC PROPULSION. NOTE 5: EXPERIMENTAL STUDY OF A MAGNETIC FIELD STABILIZED ARC-JET
A. C. Robotti and M. Oggero Jun. 1984 13 p ref Transl. into ENGLISH from La Ricerca Sci., Year 33, Rendiconti A (Italy), v. 3, no. 1, ser. 2, 1963 p 28-35 Original language document was announced as N70-75497 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-77474; NAS 1.15:77474) Avail: NTIS HC A02/MF A01 CSCL 20I

The possibility of using an electric arc under the influence of a magnetic field in ambient air to transform the heat energy of the working fluid arc into the kinetic energy of the jet was investigated. A convergent-divergent type nozzle was used. Variation of specific thrust and chamber pressure are discussed. Nitrogen was the propellant used. A.R.H.

N84-34267# Nagoya Univ. (Japan). Inst. of Plasma Physics.
TURBULENT DIFFUSION FOR THE RADIAL TWIST MAP
Tadatsugu Hatori, Tetsuo Kamimura, and Yoshi H. Ichikawa 15 Jun. 1984 23 p refs
(IPPJ-685) Avail: NTIS HC A02/MF A01

An analytical tool is given to study the statistical properties of the radial twist map, X sub n + 1 + X sub n + alpha (Y sub n + 1) and Y sub n + 1 = Y sub n + Af (X sub n) number alpha (Y) and arbitrary periodic force f(X). The case for which f(X)=sin 2 X and arbitrary alpha is treated in the region of large A. The turbulent diffusion coefficient D for the chaotic orbit relaxes as T(-1/2) to A(2)/4, except for the case of the standard map, where the eventual value of D is different from A(2)/4.

R.S.F.

N84-34268# Nagoya Univ. (Japan). Inst. of Plasma Physics.
CATASTROPHE IN PLASMA FOCUS EVOLUTION
Kazunari Ikuta 13 Jun. 1984 18 p refs
(IPPJ-686) Avail: NTIS HC A02/MF A01

A theory of generating a strong electric field in a dense plasma column in plasma focus is established by applying the formula for the electron thermal conductivity in destroyed magnetic surfaces like those in Tokamaks. A possible origin of the electric field is the abrupt rise of plasma resistivity when the irregularity of magnetic field is weak. However, the electric field is possibly from the inductive origin in the case of the irregularity attaining a certain level. Both origins need to be mixed up depending on the magnitude of the irregularity. Author

N84-34269# Nagoya Univ. (Japan). Inst. of Plasma Physics.
NUMERICAL ANALYSIS ON THE ION SPECIES RATIOS IN A STEADY STATE HYDROGEN PLASMA
Osamu Fukumasa, Ryohei Itratani (Kyoto Univ., Japan), Setsuo Saeki, Katashi Osaki, and Satoshi Sakiyama 28 May 1984 45 p refs
(IPPJ-687) Avail: NTIS HC A03/MF A01

Ion species ratios in a hydrogen plasma are calculated systematically as a function of plasma parameters, i.e., the electron density, the electron temperature, the pressure of hydrogen gas and the plasma volume. Futhermore, in the present analysis, the recombination factor for hydrogen atoms at the wall surface of a vacuum vessel is treated as another plasma parameter. The most significant point is that ion species ratios depend strongly not

only on plasma parameters, but also on the recombination factor. The proton ratio increases with decreasing value of the recombination factor. Primary electrons also play an important role for ion species ratios, and the presence of primary electrons causes the proton ratio to decrease. Author

N84-34270# Nagoya Univ. (Japan). Inst. of Plasma Physics.
ALPHA-PARTICLE SIMULATION USING NBI BEAM AND ICRF WAVE
Y. Ogawa and Y. Hamada 1 Jun. 1984 28 p refs
(IPPJ-688) Avail: NTIS HC A03/MF A01

An idea to produce the distribution function similar to that of alpha-particles in an ignited plasma is proposed. This concept is attributed to the acceleration of the injected beam up to about 1 MeV/nucleon by the ion cyclotron range of frequency (ICRF) wave with cyclotron higher harmonics. This method makes it possible to perform the simulation experiments for alpha-particles under the condition of moderate plasma parameters. It is found that 3 omega(ci) ICRF wave is preferable compared with other cyclotron harmonics, from the viewpoints of the effective tail formation with smaller bulk ion heating and lower amplitude of the applied electric field. The formula for the maximum energy of the extended beam is also derived. Author

N84-34271# Nagoya Univ. (Japan). Inst. of Plasma Physics.
IMPURITY ORIGIN DURING ICRF HEATING IN JIPP T-IIU TOKAMAK
N. Noda, T. Watari, K. Toi, E. Kako, K. Sato, K. Ohkubo, K. Kawahata, I. Ogawa, T. Tetsuka, S. tanahashi et al 7 Jun. 1984 27 p refs Presented at the 6th Intern. Conf. on Plasma Surface Interactions in Controlled Fusion Devices, Nagoya, Japan, 14-18 May 1984 Submitted for publication
(IPPJ-682) Avail: NTIS HC A03/MF A01

Replacing stainless steel limiters by graphite limiters, it was found that radiations from iron and titanium ions were significantly reduced. Total radiation and loop voltage also decreased. This indicates the limiters are the major impurity sources both in Ohmic and RF heating phases. Although titanium radiations increased with RF power injected by an antenna with a titanium Faraday shield, the maximum intensity was much smaller than those in experiments where the titanium-flashed stainless steel limiters were used. Thus it was found that the Faraday shield is less important as an impurity source than limiters. Toroidal asymmetry observed for OII radiations suggests that the energetic charge-exchange neutrals play a role in releasing oxygen from the wall and that those energetic particles are relatively abundant in the toroidal sections near the antenna. The radiation H(alpha) + D(alpha) decreases during RF pulse around the limiter, which may be due to the change in hydrogen/deuterium recycling at the limiter. This reduction is greater with graphite limiters than with stainless steel limiters. The relation between recycling and impurity release is briefly discussed. M.G.

N84-34272# Nagoya Univ. (Japan). Inst. of Plasma Physics.
VISIBLE-LIGHT IMAGING MHD STUDIES OF THE EDGE PLASMA IN THE JIPP-T-IIU TOKAMAK
K. Yamazaki, K. Haba, S. Hirokura, K. Kawahata, N. Noda, K. Matsuura, K. Sato, S. Tanahashi, Y. Taniguchi, K. Toi et al Jun. 1984 16 p refs Presented at the 6th Intern. Conf. on Plasma Surface Interactions in Controlled Fusion Devices, Nagoya, Japan, 14-18 May 1984
(IPPJ-683) Avail: NTIS HC A02/MF A01

The MHD activity and turbulence near the plasma edge were studied on the JIPP-T-IIU Tokamak using a new high-speed visible-light image-converter video-camera system. Different from conventional cinefilm and photo-diode array systems, this system is convenient for the instantaneous display of the high-speed optical plasma images after plasma discharges. The effectiveness of this instrument for the research of the plasma wall interaction was demonstrated in this experiment. The observed characteristics on the edge-plasma behavior are as follows: (1) the helical mode structure of the luminous plasma boundary suggesting plasma-surface interaction is identified in the case of OH or ICRF-heated discharge; (2) in the LH-current drive case, no clear large-scale coherent modes are identified, however, on the initial stage a medium-scale turbulence is found; (3) before current disruptions, an m=2 or m=3 helical mode is found and up-down asymmetric light emissions are often observed during disruptions. Author

N84-34273# Nagoya Univ. (Japan). Inst. of Plasma Physics.
ABNORMAL ENERGY DEPOSITION ON THE WALL THROUGH PLASMA DISRUPTIONS
K. Yamazaki and G. L. Schmidt (Princeton Univ., N.J.) 14 Jun. 1984 24 p refs Presented at the 6th Intern. Conf. on Plasma Surface Interactions in Controlled Fusion Devices, Nagoya, Japan, 14-18 May 1984
(IPPJ-684) Avail: NTIS HC A02/MF A01

The dissipation of plasma kinetic and magnetic energy during sawtooth oscillations and disruptions in Tokamaks is analyzed using Kadomtsev's disruption model and the plasma-circuit equations. New simple scalings of several characteristic times are obtained for sawteeth and for thermal and magnetic energy quenches of disruptions. The abnormal energy deposition on the wall during major or minor disruptions, estimated from this analysis, is compared with bolometric measurements in the PDX Tokamak. Especially, magnetic energy dissipation during the current termination period is shown to be reduced by the strong coupling of the plasma current with external circuits. These analyses are found to be useful to predict the phenomenological behavior of plasma disruptions in large future Tokamaks, and to estimate abnormal heat deposition on the wall during plasma disruptions. Author

N84-34274# Nagoya Univ. (Japan). Inst. of Plasma Physics.
EFFECTS OF NEUTRALS ON PARTICLE TRANSPORT OF A PLASMA
K. Hirano 23 May 1984 12 p refs
(IPPJ-681) Avail: NTIS HC A02/MF A01

If the ambipolar motion of the plasma across the magnetic field is affected by the field braiding or the end shorting effects, completely different behaviors of the plasma appear whether the gas is injected by a puff or a pellet. In the case of a gas puffing any steady state recycling may not be possible since a large friction force form neutrals is always rendered to pinch the plasma in. Neutrals injected by a pellet follow up quickly to the plasma flow to eliminate the friction between, so that no enhanced transport by neutrals on the classical one is expected. Author

N84-34275*# Alabama Univ., Huntsville. School of Mathematical and Natural Sciences.
PLASMA AND MAGNETOSPHERIC RESEARCH Quarterly Progress Report, Jun. - Aug.1984
Richard H. Comfort and James L. Horwitz Sep. 1984 14 p refs (Contract NAS8-33982)
(NASA-CR-171157; NAS 1.26:171157) Avail: NTIS HC A02/MF A01 CSCL 20I

Research developments in the following areas are discussed: (1) an ion trajectory computer code which plots the paths of ions ejected from the polar cusp ionosphere; (2) the response of plasmaspheric ion temperatures to geomagnetic activity; (3) spacecraft sheath effects; (4) plasma flow; (5) neutral gas temperatures; and (6) instrument fabrication, modification, and maintenance. R.S.F.

N84-34276# Naval Research Lab., Washington, D. C.
VIBRATIONAL ENERGY RELAXATION AND DISSOCIATION IN N2 Interim Report, 1983 - 1984
A. W. Ali and S. Slinker 28 Jun. 1984 55 p
(DARPA Order 4395)
(AD-A143606; NRL-MR-5347) Avail: NTIS HC A04/MF A01 CSCL 20/9

A master equation is solved for a nitrogen discharge to determine the vibrational energy relaxation and dissociation. The master equation includes the effects of electron collisions with the molecule, the vibrational-vibrational energy exchange and vibrational-translational energy conversion between the molecules. The establishment of a vibrational distribution is described by a

vibrational temperature which is nearly Boltzman and its obtained from the density of 31 vibrational levels. For most conditions the dissociation rate via the vibrational ladder is higher for higher vibrational temperatures. The vibrational temperature is generally depressed due to V-V and T-V effects. Author (GRA)

N84-34277# Naval Research Lab., Washington, D. C.
ELECTROSTATIC EQUATIONS FOR LARGE SCALE PLASMA SIMULATION STUDIES Memorandum Report, Oct. 1983 - Oct. 1984
K. Hain and J. Fedder 19 Jul. 1984 31 p
(AD-A143640; NRL-MR-5385) Avail: NTIS HC A03/MF A01 CSCL 12/1

A set of equations for large scale simulation studies of plasma systems in the electrostatic approximation are derived. The equations are written for a generalized geometry as well as for a dipole geometry which is suitable for the Earth's magnetosphere. Author (GRA)

N84-34278# Naval Research Lab., Washington, D. C.
A USERS GUIDE TO KLYSMA 2: A MULTIFLUID TRANSPORT CODE Interim Report, Oct. 1983 - Oct. 1984
D. S. Spicer and R. W. Clark 14 Jun. 1984 38 p
(S99-QMXB)
(AD-A143784; AD-E000581; NRL-MR-5348) Avail: NTIS HC A03/MF A01 CSCL 09/2

This report documents a new one dimensional multifluid transport code designed to study the cross magnetic field transport of magnetized plasma in the presence of both anomalous and classical transport processes, radiation, and chemical reactions. GRA

N84-34279# Naval Research Lab., Washington, D. C.
A STUDY OF LONG AEROSOL INITIATED LASER INDUCED AIR BREAKDOWN PLASMAS Memorandum Report, Oct. 1982 - Sep. 1983
R. E. Pechacek, M. Raleigh, J. R. Greig, D. P. Murphy, and F. Camelio 29 Jun. 1984 37 p
(S03-84-SL; RR0-1109)
(AD-A143967; NRL-MR-5362) Avail: NTIS HC A03/MF A01 CSCL 20/9

Results from three separate experiments on aerosol initiated, laser induced, air breakdown are described. The purpose of these experiments was to determine the maximum length of air breakdown plasma that can be created with a given laser pulse. Two separate neodymium glass lasers were used; the first produced an output pulse of 30 J in 60 ns and the second produced 200 J in 4 ns. Both pulses were at the wavelength of 1.06 micron. Two of the experiments used the aerosol produced by burning black gunpowder in the atmosphere which gave a mean particle size of about 0.5 micron. The third experiment attempted to use ragweed pollen with a mean particle size of about 10 micron, but these particles could not be adequately dispersed and no useful results were obtained. GRA

N84-34280*# Science Applications, Inc., McLean, Va.
TEMPORAL EVOLUTION OF WHISTLER GROWTH IN A COLD PLASMA INJECTION EXPERIMENT
G. Ganguli, P. Palmadesso, and J. Fedder 6 Jul. 1984 29 p
(RR0-3302)
(NASA-CR-173972; NAS 1.26:173972; AD-E751074;
NRL-MR-5379) Avail: NTIS HC A03/MF A01 CSCL 20I

Using a simple time dependent cold plasma density model and assuming a typical ambient radiation belt environment, the authors study the evolution of the Whistler mode turbulence and particle precipitation in a cold plasma release experiment similar to one which may be conducted as part of the AMPTE program. It is known from earlier work that the release of cold lithium ions can significantly lower the critical energy E sub c above which the resonant radiation belt electrons can pitch angle scatter. They study the time evolution of the one pass gain factor for a whistler wave packet and find that for parameters accessible to AMPTE type experiments the gain factor is large enough to ensure strong Whistler turbulence and strong pitch angle diffusion of radiation belt particles with energies in the range between the ambient value of E sub c and the reduced value of E sub c. Estimates for the total power input to the ionospheric footprint of the release are of the order of an erg/sq cm/sec. This precipitated energy should produce a patch of visible aurora. This effect should also persist for many hours. Author (GRA)

N84-34281# Naval Research Lab., Washington, D. C. Plasma Radiation Branch.
A PROPOSED TECHNIQUE FOR CREATION AND DETECTION OF HOT ELECTRON IONIZATION AND GAIN EFFECTS IN A LASER-PRODUCED TIN PLASMA
J. P. Apruzese and J. Davis 19 Jul. 1984 22 p
(AD-A144025; AD-E751074; NRL-MR-5391) Avail: NTIS HC A02/MF A01 CSCL 20/9

It has recently been demonstrated that suprathermal electrons, while deleterious to laser fusion, may have significant and beneficial effects in plasma ionization and promoting population inversions in neon-like ions. This report considers experimental demonstration of these effects. Using linearly focused and aligned beams, a series of shots with planar in tin targets (Z=50) is proposed. At irradiances of approx. = 1-4 X 10 to the 14th power W 1/cm, both the energies and numbers of hot electrons produced by a 1.05 micron laser beam should be appropriate for substantial enhancement of gain in the 3s-3p transition of neon-like tin at 118.2A. If possible a quiescent plasma should be prepared with a 0.35 micron beam, which would be followed by a 1.05 micron pulse to create a burst of hot electrons at 4-5 keV to pump the upper leasing state. Author (GRA)

N84-34282# Massachusetts Univ., Amherst. Dept. of Chemistry.
DYNAMICS OF HEAT, MASS AND MOMENTUM TRANSFER IN AN INDUCTIVELY COUPLED PLASMA Final Report, 2 Aug. 1982 - 30 Nov. 1983
R. M. Barnes 23 Mar. 1984 16 p refs
(Contract DE-AC02-77ER-04471)
(DE84-014121; DOE/ER-04471/4) Avail: NTIS HC A02/MF A01

Special attention was given to the development of sophisticated mathematical models for the calculation of the flow and temperature fields in the induction torch under different operating conditions. The model originated by Boulos is particularly valuable since it is the only one which gives detailed information about the flow field as well as the temperature field in the plasma discharge through the solution of the two dimensional flow and energy equations simultaneously with the one dimensional electric and magnetic field equations. This model has been extended and refined substantially during the current research investigation. DOE

N84-34283# Los Alamos Scientific Lab., N. Mex.
TOROIDAL EQUILIBRIUM IN AN IRON-CORE REVERSED FIELD PINCH
Guthrie Miller Apr. 1984 26 p
(Contract W-7405-eng-36)
(DE84-013858; LA-10020-MS) Avail: NTIS HC A03/MF A01

An analytical theory of toroidal equilibrium in the ZT-40M reversed field pinch is obtained, including effects of iron cores and resistive shell. The iron cores alter the form of the equilibrium condition and cause the equilibrium to be unstable on the shell-resistive time scale. DOE

N84-34284# McElroy (Ralph) Co., Austin, Tex.
FLUTE INSTABILITY OF PLASMA IN A GAS-DYNAMIC TRAP
V. P. Nagornii, D. D. Ryutov, and G. V. Stupakov Jun. 1984 57 p refs Transl. into ENGLISH of "Zhelobkovaya Neustoichivost Plazmy v Gazodinamicheskoi Lovushke" Preprint 83-73 Novosibirsk, USSR
(Contract W-7405-eng-48)
(DE84-013348; UCRL-Trans-11974; Preprint-83-73) Avail: NTIS HC A04/MF A01

The flute instability in a gas dynamic trap in which the mean free path lambda is smaller than the trap length (L) is studied.

Two effects are taken into account: (1) the influence on the flute instability of the energy and particle injection maintaining the stationary state and (2) the wave convection by the plasma outflowing from the system. The expression for the instability growth rate is obtained and the necessary and sufficient criterion for stability is formulated. It is found that even when the flute instability is stabilized, a slow instability having a growth rate of order of the reciprocal of the particle lifetime is possible. Some effects considered herein are also of interest for mirror traps with lambda < L. DOE

N84-34285# McElroy (Ralph) Co., Austin, Tex.
INFLUENCE OF PLASMA FLOW ON FLUTE INSTABILITY
V. P. Nagornii, D. D. Ryutov, and G. V. Stupakov Jun. 1984 39 p refs Transl. into ENGLISH of "Vliyanie Techeniya Plazmy na Zhelobkovuyu Neustoichivost" Preprint 83-74 Novosibirsk, USSR
(Contract W-7405-eng-48)
(DE84-013314; UCRL-Trans-11976; preprint-83-74) Avail: NTIS HC A03/MF A01

The effect of plasma flow along magnetic field lines on flute instability in a periodic array of axisymmetric mirror cells was studied. The potential energy of flute oscillations is derived by MHD equation, the positive definiteness of which gives a sufficient condition for stability. For two limiting cases, paraxial mirror cells and cells with the point mirrors, the stability problem is completely solved and the growth rate of the instability is found. For the cells with point mirrors a full spectrum of oscillations having m = infinity is obtained. DOE

N84-34286# Los Alamos Scientific Lab., N. Mex.
OBSERVATIONS OF RAMPED CURRENT OPERATION IN ZT-40M
J. A. Phillips, D. A. Baker, L. C. Burkhardt, R. Erickson, A. Haberstich, J. C. Ingraham, E. M. Little, J. G. Melton, K. F. Schoenberg, R. G. Watt et al May 1984 14 p refs
(Contract W-7405-eng-36)
(DE84-015076; LA-10060-MS) Avail: NTIS HC A02/MF A01

A mode of reversed field pinch (RFP) startup is tested. Instead of increasing the toroidal current almost sinusoidally to its maximum, as is normally done, the current is initially raised to approximately 70 kA in 0.8 ms and subsequently slowly ramped up to approximately 170 kA in 14 ms. The behaviors of toroidal flux, particle density, temperature, and radiated power for the ramped discharges are compared with fast current rise, flat topped operation. The successful demonstration of ramped toroidal discharges has an important impact on future large RFP experiments since the voltage necessary to drive the toroidal current for slow (10 to 20 ms) startup is reduced. DOE

N84-34287# Oak Ridge National Lab., Tenn. Fusion Energy Div.
THE EBT-S 28-GHz, 200-kW, CW, MIXED-MODE, QUASI-OPTICAL PLASMA HEATING SYSTEM
T. L. White, H. D. Kimrey, T. S. Bigelow, D. D. Bates, and H. O. Eason Jul. 1984 33 p refs
(Contract DE-AC05-84OR-21400)
(DE84-014415; ORNL-TM-9175) Avail: NTIS HC A03/MF A01

The ELMO Bumpy Torus-Scale (EBT-S) 28-GHz, 200-kW, CW, plasma heating system consists of gyrotron oscillator, an oversized waveguide two bend transmission system, and a quasi optical mixed mode microwave distribution manifold that feeds microwave power to the 24 plasma loads of the EBT-S fusion experiment. Balancing power to the 24 loads is achieved by adjusting the areas at 24 coupling irises. System performance is easily measured using system calorimetry. The distribution manifold mixed-mode power transmission, reflection, and loss coefficients are 89%, 6%, and 5%, respectively. The overall system efficiency (plasma power/gyrotron power) is 80%, but with some modifications to the distribution manifold the ultimate efficiency can approach 90%. The system reliability is outstanding with a world's record 100, 000 kW h of 28-GHz energy delivered to the EBT-S device with well over 1,000 operating hours. DOE

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N84-34288 Council for Scientific and Industrial Research, Pretoria (South Africa). Foreign Language Service.
EFFECT OF ANNEALING UNDER THERMODYNAMICALLY STABLE CONDITIONS ON THE FORMATION AND TRANSFORMATION OF STRUCTURAL DEFECTS IN DIAMOND MONOCRYSTALS
L. D. Belimenko et al 1983 7 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 259, no. 6, 1981 p 1360-1363
(CSIR-Trans-1737) Avail: NTIS HC A02

Experiments were carried out to examine the formation and transformation of various synthetic diamond defects containing bound nitrogen. Annealing for 3 h at 1600 to 1800 C results in little change in the concentration of C- and A-centers. A marked reduction of C-centers from the initial concentration with the appearance of A-centers was observed at 1850 C and higher. This change in C- and A-center concentration obeys Abraham's equation which describes the kinetics of solid separation with the formation of extrinsic clusters during this stage, limiting diffusion. Electron-microscopic examination revealed that the samples with an original dispersed nitrogen concentration of 10(18) cm(-3) after annealing for 2 to 3 h at temperatures above 1850 C have platelets 50 to 200 A in size. These samples were also found to contain dislocation loops. The relationship between these two types of defects and the process of segregation of nitrogen atoms is supported by the absence of such defects in the annealed samples with very low initial nitrogen content. The IR and photoluminescence results indicate that point defects of different types formed at short and long annealing times. These findings suggest that defects in diamonds are related to the aggregation of the atoms of nitrogen admixture and are formed in the course of subsequent annealing. M.G.

N84-34289 Council for Scientific and Industrial Research, Pretoria (South Africa). Foreign Language Service.
CRYSTALLIZATION OF CUBIC BORON NITRIDE IN THE PRESENCE OF SILICON
V. B. Sipilo et al 1983 7 p refs Transl. into ENGLISH from Sverhtverdye Mater. (USSR), no. 3, 1981 p 5-8
(CSIR-Trans-1753) Avail: NTIS HC A02

The average crystal growth rate (v) and the processes of formation of cubic boron nitride (CBN) crystallization centers as a function of synthesis time and temperature were considered using different silicon concentrations in the starting hexagonal boron nitride. The average linear crystal growth rate, whether alloyed or unalloyed with silica, decreased with an increase in synthesis time. This decrease in (v) on the introduction of silicon into the reaction mixture can be explained by the increase in viscosity which decreases the mobility of boron and nitrogen atoms and the solubility of hexagonal BN in the catalyzer material. The spontaneous formation of CBN crystals and their growth in the initial period result from the boron and nitrogen melt which is supersaturated with atoms at slightly higher than equilibrium pressure. Crystals are formed during synthesis in the starting period. The relation between the number of crystallization centers and the synthesis time is nearly identical. S.B.

N84-34290# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
THIN-FILM PHOTOVOLTAIC RESEARCH AND DEVELOPMENT PROGRAM OF THE SOLAR ENERGY RESEARCH INSTITUTE
Edward S. Sabisky Oct. 1983 22 p refs Presented at the Phys. and Tech. Appl. of Amorphous Mater., Nedo Solar Cell Tech. Committee Meeting, Tokyo, 15 Nov. 1983
(Contract DE-AC02-83CH-10093)
(SERI/TP-211-2125) Avail: NTIS HC A02/MF A01

The technical plan and recent research and development

activities at SERI for developing thin film and multijunction concepts for photovoltaic cells are presented. The primary emphasis is on: amorphous materials; photocrystalline thin films including cadmium sulfide/copper binary and ternary material combinations; gallium arsenide and other III to V high efficiency materials; polycrystalline silicon; photoelectrochemical cells, and other photovoltaic materials and devices, cost factors are also discussed. A.R.H.

N84-34291# Department of the Army, Washington, D. C.
METHOD OF DIRECTLY CRYSTALLIZING A (Sm + Ti):Fe = 1:5 COMPOUND Patent Application
F. J. Cadieu, inventor (to Army) Filed 30 Apr. 1984 15 p
(AD-D011061; US-Patent-Appl-SN-605456) Avail: NTIS HC A02/MF A01 CSCL 07/2

The general object of this invention is to provide a method of directly crystallizing samples of the Sm-Fe system onto a substrate. A more particular object of the invention is to provide such a method of synthesizing a metastable phase at a composition corresponding to a (Sm + Ti) to Fe atomic ratio of 1:5. Metastable in this context means that the phase formed at a 1:5 atomic ratio is not present in the pure Sm-Fe system. It has now been found that the aforementioned objectives can be attained by synthesizing by selectively thermalizing sputtering onto heated substrates with the addition of Ti as a stabilizing agent. Room temperature intrinsic coercive forces of 6.2 kOe and static energy products of 5.5 MG-Oe have been obtained in this Ti stabilized (Sm + Ti):Fe 1:5 compound. Author (GRA)

N84-34292# Wright State Univ., Dayton, Ohio.
COMPOUND SEMICONDUCTOR CHARACTERIZATION Final Technical Report, 16 Dec. 1980 - 31 Dec. 1983
D. C. Look, P. W. Yu, S. B. Nam, D. C. Walters, and S. Chaudhuri Wright-Patterson AFB, Ohio AFWAL 8 Jun. 1984 94 p
(Contract F33615-81-C-1406)
(AD-A143601; AFWAL-TR-84-1075) Avail: NTIS HC A05/MF A01 CSCL 20/12

Impurities and defects in semiconducting and semi-insulating GaAs and other III-V compounds have been investigated by electrical, optical, and mass spectroscopic techniques. Field-effect transistors have been fabricated and tested. Author (GRA)

N84-34293# Brown Univ., Providence, R. I.
APPLICATION OF SURFACE MAGNETOPLASMONS ON SEMICONDUCTOR SUBSTRATES Final Report, 22 Sep. 1980 - 31 Dec. 1983
D. M. Bolle, A. V. Nurmikko, and G. S. Heller 31 Dec. 1983 23 p Prepared in cooperation with Lehigh Univ., Bethlehem, Pa.
(Contract DAAG29-80-K-0074)
(AD-A143767; ARO-17344.1-EL) Avail: NTIS HC A02/MF A01 CSCL 20/12

A significant need exists for developing active and passive components in the millimeter (MM) and submillimeter (SMM) wavelength, i.e., 100-1000 GHz. The use of solid state materials and phenomena, particularly for semiconductors, has become increasingly important in this direction. One principal semiconductor phenomenon which has been explored for use in MM and SMM control components is the solid state plasma state. Derived from this state are controllable conductive and dielectric properties which, in turn, are useful in controlling MM and SMM transmission and propagation. Furthermore, with the application of a static magnetic field, magnetized solid state plasmas exhibit a variety of interesting and potentially useful effects. Studies of electromagnetic (EM) wave interaction with magnetized semiconductor plasmas have revealed a number of specific physical properties which may be used for device purposes. In this work, we study first the propagation characteristic of SMM wave in one dimensional insulated image guide structures. GRA

N84-34294# Dayton Univ., Ohio.
OPTICAL AND ELECTRICAL CHARACTERIZATION OF MULTIPLY DOPED SILICON: A STUDY OF THE Si:(In, Al) SYSTEM Interim Report, Mar. 1981 - Mar. 1983
G. J. Brown, M. C. Ohmer, D. W. Fischer, J. J. Rome, and K. D. Beasley Feb. 1984 59 p
(Contract F33615-81-C-5095)
(AD-A143820; AFWAL-TR-83-4108) Avail: NTIS HC A04/MF A01 CSCL 20/12

Infrared absorption, spectral photoconductivity, photoluminescence, and Hall effect transport measurements have been used to study the optical and electrical properties of silicon single crystals grown by the Czochralski method, which were intentionally doped with indium and aluminum. Thermal annealing did not produce the expected concentrations of In-X acceptors but did increase the concentration of donors in this material. The Al-X level was observed in a concentration of 1% of the parent concentration. Temperature dependence of the intensity of Al-X excited states was determined by photothermal ionization and observed to be the same as that of simple group IIIA acceptors. GRA

N84-34295# Rockwell International Corp., Thousand Oaks, Calif.
GROWTH OF CdTe/HgTe SUPERLATTICE WITH THE LADA (LASER ASSISTED DEPOSITION AND ANNEALING) TECHNIQUES Final Report, 1 Sep. 1981 - 31 Jan. 1983
J. T. Cheung Jun. 1983 32 p
(Contract N00014-81-C-0621; NR Proj. 372-121(427))
(AD-A143948; SC5314.2FR) Avail: NTIS HC A03/MF A01 CSCL 20/2

Growth of HgTe/CdTe has been demonstrated by the laser assisted deposition technique (LADA). HgTe and CdTe compounds were used as sources. Multilayered structures were deposited by scanning a pulsed laser beam alternately over these sources. Superlattice parameters such as composition and period thickness were controlled by the scanning mode of a focused laser beam. The superlattices were characterized optically and electrically. Effect of band narrowing due to superlattice formation was observed. Author (GRA)

N84-34296# Stanford Univ., Calif. Physics Labs.
SUPERCONDUCTING AND SEMICONDUCTING PROPERTIES OF ELECTRON-BEAM EVAPORATED MATERIALS Final Technical Report, 1 Dec. 1975 - 31 Oct. 1983
M. R. Beasley Apr. 1984 10 p refs
(Contract DE-AT03-76ER-71043)
(DE84-013470; DOE/ER-71043/T1) Avail: NTIS HC A02/MF A01

The upper critical field Hc2 of the high T/sub c/ A15 superconducting compounds is studied. Interest in this problem was occasioned by the availability of new materials preparatory techniques (electron beam coevaporation) that made possible for the first time the preparation of samples in which the relevant material parameters (e.g., composition and order) could be systematically varied. The work involved critical tests of the existing theory, extension of the theory, use of the theory to determine important microscopic material parameters, and development of new principles for the optimization of Hc2 in practical high field superconducting conductors. As a result of this program, optimization of the practically important high field superconductors Nb3Sn and V3Ga are proceeding more rationally, fundamental additions to the theory of high field superconductors were introduced, and new insights were obtained regarding the factors governing the high T/sub c/'s of this important class of superconductors. DOE

N84-34297# Los Alamos Scientific Lab., N. Mex.
OPTICAL EFFECTS OF THE GRAVITATIONALLY INDUCED CONCENTRATION GRADIENT IN TRICRITICAL 3He-4He
Shoou-Shinn Shiah and James K. Hoffer 1984 3 p refs Presented at the 17th Intern. Conf. on Low Temp. Phys., Karlsruhe, West Germany, Aug. 1984
(Contract W-7405-eng-36)
(DE84-009972; LA-UR-84-944; CONF-840842-2) Avail: NTIS HC A02/MF A01

Tricritical scaling is used to calculate the gravitationally induced concentration gradients (delta x/ delta z) sub T in near-tricritical mixtures of He-3 and He-4. It is possible for superfluid and normal fluid to coexist at temperatures above the tricritical

temperature, separated by a point where (delta x/ delta z) sub T diverges weakly. Calculations of the refraction of light.induced by (delta x/ delta) sub T are presented that reveal the presence of a sharp kink in the refraction angle (alpha), leading to the physical observation of an interaction between coexisting normal and superfluid phases. DOE

N84-34298# Department of Energy, Washington, D. C.
PROCESS FOR FORMING PURE SILVER OHMIC CONTACTS TO N- AND P-TYPE GALLIUM ARSENIDE MATERIALS Patent Application
Stephen J. Hogan, inventor (to DOE) Filed 13 Mar. 1983 19 p (Contract DE-AC02-77CH-00178)
(DE84-014515; US-Patent-Appl-SN-494485) Avail: NTIS HC A02/MF A01

An improved process for manufacturing gallium arsenide semiconductor devices with an n-type gallium arsenide substrate layer and a p-type gallium arsenide diffused layer is disclosed. The improved process comprises forming a pure silver ohmic contact to both the diffuse layer and the substrate layer wherein the n-type layer comprises a substantially low doping carrier concentration. DOE

N84-34299# Argonne National Lab., Ill.
WEAK COUPLING TESTS OF LATTICE QCD
Eve Kovacs 1984 12 p refs Presented at the workshop on Gauge Theory on a Lattice, Argonne, Ill., 5-7 Apr. 1984
(Contract W-31-109-eng-38)
(DE84-013440; ANL-HEP-CP-84-21; CONF-8404119-4) Avail: NTIS HC A02/MF A01

For many arbitrary lattice with arbitrary SU(N) actions, the perturbative value of lambda sub latt/lambda sub MOM is estimated from the Monte Carlo data at weak coupling by analyzing the perturbative expansions for various Wilson loop ratios. Here, general loop ratios including those of polygons and parallelograms are considered. The lowest order perturbative expansions are calculated and some applications to the Monte Carlo data are presented. DOE

N84-34300# Illinois Univ., Urbana-Champaign.
MOMENTUM DISTRIBUTIONS IN hcp, bcc, AND LIQUID He-4
P. E. Sokol, R. O. Simmons (Argonne National Lab., Ill.), D. L. Price (Argonne National Lab., Ill.), and R. O. Hilleke May 1984 3 p refs Presented at the 17th Intern. Conf. on Low Temp. Phys., Karlsruhe, West Germany, 15-22 Aug. 1984
(Contracts DE-AC02-76ER-01198; W-31-109-eng-38)
(DE84-014679; CONF-840842-21) Avail: NTIS HC A02/MF A01

The nuclear momentum distribution in horizontal close packed (hcp), body centered cubic lattices (bcc), and liquid He-4 at constant density over a temperature range $0.96K < T < 4.0K$ was measured using deep inelastic neutron scattering. No temperature dependence of the momentum distribution in the hcp solid or the liquid was found. No difference between the hcp, bcc, and liquid phases was observed. The average kinetic energy per atom is lower than the best present theories predicted. DOE

N84-34301# Research Inst. of National Defence, Linkoeping (Sweden). Dept. 3.
APPARATUS FOR THE DETERMINATION OF ION DRIFT IN MIS STRUCTURES
Ewa Thoerngren Apr. 1983 39 p refs In SWEDISH; ENGLISH summary
(FOA-C-30360-E1; ISSN-0347-3708) Avail: NTIS HC A03/MF A01; Research Institute of National Defence, Stockholm KR 50

An apparatus using a scanned light pulse technique for measuring the impurity ions drift in the insulator of an MIS is introduced. Test measurements comparing this method with the CV-technique (where the high frequency capacitance is recorded as a function of the voltage used on the metal electrode), show that the same information is obtained with considerablely simpler equipment. Author (ESA)

N84-34302# Kernforschungsanlage, Juelich (West Germany). Inst. fuer Festkoerperforschung.
MAGNETO-OPTICAL STUDIES OF EPITAXIAL EuS FILMS AND (EuS/SrS) LAYER SYSTEMS [MAGNETOOPTISCHE UNTERSUCHUNGEN AN EPITAKTISCHEN EUS-SCHISHTEN UND (EUS-/SRS)-SCHICHTSYSTEMEN]
Manuel Mirabal-Garcia Apr. 1984 67 p refs In GERMAN; ENGLISH summary Sponsored by DAAD and CONACYT
(JUEL-1910; ISSN-0366-0885) Avail: NTIS HC A04/MF A01

Epitaxial EuS ferromagnetic semiconductor single films, (EuS/SrS) layered structures, and Eux Sr1-xS homogeneously mixed films grown by molecular beam epitaxy (MBE) on silicon substrates are described. Critical field strength for domain nucleation, HK, coercive field, HC, and saturation field, HS, were studied at temperatures of 6 to 14.5K and as a function of angle varied between magnetically easy and hard axes of (110)- and (111)-EuS films. By extrapolating the linear decrease of H2 K, C, S vs T to zero the Curie temperatures of the (110)- and (111)-EuS films are determined to 15.3 + or - 0.2 K and 14.5 + or - 0.2 K respectively. Brillouin light scattering experiments from accoustic spin waves were evaluated with the Damon-Eshbach theory by taking the temperature and field dependence of the magnetization from molecular field theory. All EuS samples were investigated in the paramagnetic region up to 300 K where the Brillouin spectroscopy can measure the Zeeman splitting of the 8 S 7/2 ground state of Eu2+ ions. Author (ESA)

N84-34303# Siemens A.G., Erlangen (West Germany). Forschungslab.
SUPERCONDUCTING RESONATORS Final Report, Dec. 1982
Bernhard Hillenbrand, Norbert Krause, Kurt Schintzke, and Yilmaz Uzel Bonn Bundesministerium fuer Forschung und Technologie Jun. 1984 108 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-119; ISSN-0340-7608) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 23

Thin walled cylindrical and spherical TM010 cavities (X band) were fabricated by shaping of Nb sheets or tubes. A chemical polishing procedure was developed. Without an explicit thermal treatment magnetic flux densities > 90 mT (acceleration field strength > 20 MV/m with quality factors > 1 billion are obtained. Measurements of the thermal conductivity show that these values are close to the thermal limitation. Most Nb-cavities were coated with Nb3Sn. The peak value of the critical flux density which is nearly temperature independent between 1.3 and 4.2 K, is 68 mT (acceleration field strength 16 MV/m). Author (ESA)

N84-34304# Fraunhofer-Inst. fuer Angewandte Festkoerperphysik, Freiburg (West Germany).
INVESTIGATION OF ELECTRO-OPTICAL EFFECTS IN LIQUID CRYSTALS FOR HIGH INFORMATION DENSITY OVER A WIDE TEMPERATURE RANGE Final Report, Dec. 1982
Guenter Baur, Waltraud Fehrenbach, Rudolf Kiefer, Bernd Scheuble, and Axel Stieb Bonn Bundesministerium fuer Forschung und Technologie Jun. 1984 127 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-120; ISSN-0340-7608) Avail: NTIS HC A07/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 27

Various LC configurations were investigated with respect to their applicability in displays by computer modeling. Modified nematic rotation (TN) configurations with multiplex rates of 1:64 have the greatest advantages. Dye cells are most suitable for static addressing. The influence of molecular structure and short range order on the LC material properties are discussed. Author (ESA)

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N84-34305# Maschinenfabrik Augsburg-Nuernberg A.G., Munich (West Germany). Unternehmensbereich Maschinen- und Stahlbau Werk.

OPTIMIZATION OF THE THERMODYNAMIC CYCLES OF A COLLECTIVE HEATING POWER STATION [OPTIMIERUNG DES THERMODYNAMISCHEN KRIESLAUFS EINES SAMMELSCHIENEN-HEIZKRAFT-WERKES]

G. Hausmann 1984 26 p refs In GERMAN Presented at Rahmen der Fachschau Energie auf der Hannover Messe 1984 Avail: NTIS HC A03/MF A01

The optimization of the centralized heating system of a city was studied. Modifications of the heating circuit increase the electric power characteristic from 0.20 to 0.37. A program for the calculation of the changes in the thermodynamic cyclic due to these modifications is presented. Author (ESA)

N84-34306# European Space Agency, Paris (France).

THE BASIC CONCEPT OF PARTICLE REST MASS IN A QUANTIZED RELATIVISTIC UNIVERSE

H. Broberg Jun. 1984 26 p refs

(ESA-STM-233; ISSN-0379-4075) Avail: NTIS HC A03/MF A01

The problem of linking the rest masses of particles to singularities in space-time is solved by the analysis of a comoving Einstein universe. A mathematical series which generates universes with different masses as a function of a quantum number is found. The range of elementary particle masses coincides with this series for low quantum numbers, the first member of the series has the same mass as the lightest hadron. The gravitational force constant becomes rescaled in the process, and coincides with the magnitude of the strong nuclear force for the low quantum numbers. Author (ESA)

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

N84-34307# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

RESEARCH SALARIES [SALARIOS NA CARREIRA DE PESQUISA]

Ivan J. Kantor, Antonio M. Piccina, J. Liberato, Jr., and Celso J. Sacchi Nov. 1983 31 p In ARABIC

(INPE-2971-NTE/209) Avail: NTIS HC A03/MF A01

The effect of Brazilian national salary policy on the staffing of the Institute of Space Research during the period 1976 to 1983 is analyzed. Relevant data from the journal Conjuntura Economica, The Getulio Vargas Foundation, and official documents and decrees are analyzed. The effects of salary adjustments, minimum salaries, inflation, and indexing are examined. It is predicted that inequitable adjustments of researchers' salaries will lead to an exodus of scientific talent from the Institute of Space Research.

Transl. by B.G.

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N84-34308# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

DIFFICULTIES OF SCIENTIFIC AND TECHNOLOGICAL PLANNING [DIFICULDADES PARA PLANEJAR CIENCIA E TECNOLOGIA]

Wilson Ruiz Jun. 1983 11 p In PORTUGUESE Presented at the 7th Simposio Nacl. de Pesquisa em Administracao de Ciencia e Tecnologia, Realizado em Sao Paulo, nos dias 24-26 Nov. 1982 e Promovido Pelo PACTO - IA/FEA/USP

(INPE-2786-PRE/352) Avail: NTIS HC A02/MF A01

Problems involved in scientific and technological planning are examined. The components of planning, implementation and control of planning, and deficiencies of scientific endeavors are discussed. Some of the common problems resulting in deficient planning are: (1) failure to articulate intellectual requirements; (2) insufficient knowledge of methodology; (3) lack of clarity of plans; and (4) unclear objectives, monitoring, enforcement, and communication. Successful execution of a plan entails detailed description of the final product, listing of methods to be used to achieve desired results, satisfying clientele, timely completion of the project, and project completion within the allotted budget. Transl. by B.G.

N84-34309# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

A HEURISTIC METHOD FOR THE PROBLEM OF THE DISTRIBUTION OF PERISHABLE CARGOS [UMA HEURISTICA PARA O PROBLEMA DE DISTRIBUICAO DE CARGAS PERECIVEIS]

Acioli Antonio deOlivo and Horacio Hideki Yanasse May 1984 20 p refs In PORTUGUESE; ENGLISH summary Presented at the 17th Simposio Brasileiro de Pesquisa Operacional, Rio de Janeiro, 7-9 Nov. 1984

(INPE-3133-PRE/524) Avail: NTIS HC A02/MF A01

This work is concerned with the fleet routing problem for perishable loads. The objective is to minimize this load distribution costs. Cost factors taken into consideration include fleet size and transportation costs. In addition to satisfying the demand requirements, there are also restrictions on vehicles capacities and delivery times. Sampron and Faria developed a mathematical model for this problem which was presented at the XV SBPO, 1982. These authors report limitations on the application of this model because of high processing time to obtain the optimal solution. Due to the computational difficulties in finding the optimal solution to the routing problem, an alternative way to find its solution was searched. An heuristic algorithm was developed to solve this problem which has been performed quite satisfactorily in the tests realized in terms of the solution found and the computational time. B.W.

N84-34310# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

A PROBLEM OF DETERMINING THE OPTIMAL POLICY FOR MAINTENANCE SYSTEMS WITH RESERVE MACHINES AND A VARIABLE NUMBER OF SERVERS M.S. Thesis [UM PROBLEMA DE DETERMINACAO DE POLITICA OTIMA PARA SISTEMAS DE MANUTENCAO COM MAQUINAS DE RESERVA E NUMERO VARIAVEL DE SERVIDORES]

Samuel Roberto Ximenes Costa Jul. 1984 70 p refs In PORTUGUESE; ENGLISH summary

(INPE-3197-TDL/173) Avail: NTIS HC A04/MF A01

A maintenance system in which the number of operating servers are adjusted both at arrival and repair completion epochs is considered. The production system has a finite number of identical machines, each having an exponentially distributed lifetime, and a finite number of spares. After failure, a machine is replaced by a spare, if there is any available, and is sent to the repair facility. The repair facility has a finite number of independent servers available, each having a exponentially distributed service time. The cost structure includes a cost due to lost production, a holding cost, a repair cost, and a switch-over cost when the number of operating servers is adjusted. This control problem is represented by a semi-Markov decision model. The optimality criterion considered is the long-run average cost per unit time. A policy-iteration algorithm is used to compute the parameters of the optimal control policy within a particular subclass of the class of all stationary

policies. Numerical results are given for the two-server case.
Author

N84-34311# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
OBJECTIVES: ACTIVITIES AND NEEDS OF THE DIGITAL SIMULATION LABORATORY, ATTITUDE AND ORBIT CONTROL SYSTEMS, AND THE THERMAL CONTROL LABORATORY OF THE SPACE MECHANICS AND CONTROL DEPARTMENT [OBJETIVOS, ATIVIDADES E NECESSIDADES DOS LABORATORIOS DE SIMULACAO DIGITAL, DE SIMULACAO FISICA DE SISTEMAS DE CONTROLE DE ATITUDE E DE ORBITA E DE CONTROLE TERMICO DO DEPARTAMENTO DE MECANICA ESAPACIAL E CONTROLE]
Agenor deToledo Fleury, Valcir Orlando, and Olavo Bueno deOliveira Filho Jul. 1984 84 p refs In PORTUGUESE; ENGLISH summary
(INPE-3174-RPE/459) Avail: NTIS HC A05/MF A01

The main purpose is to present objectives, activities and needs associated to the Digital Simulation, the Attitude and Orbit Control Systems and the Thermal Control Laboratories now in implementation phase in INPE - Department of Space Mechanics and Control. Despite the distinct characteristics involved with each of these laboratories, it is pointed out that the Digital Simulation Laboratory plays a fundamental role as the initial step for the activities in the other areas and also as the basic support even when the laboratories are fully operational. Sequentially characteristics, development and/or qualification tests to be performed and available equipment configurations for each of the laboratories are analyzed. Using this analysis and bearing in mind the constraints imposed by MECB satellite projects and the real development stage of the Department, objectives for short and medium terms are defined. Basic configurations are proposed for all laboratories, relative to the equipments they will need in order to satisfy the requirements associated to the projects under the Space Mechanics and Control Department responsibility. Author

N84-34312# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
THE PROBLEM OF DETERMINING THE OPTIMUM POLICY FOR MAINTAINING SYSTEMS WITH SPARE MACHINES AND A NUMBER OF VARIABLE SERVERS [UM PROBLEMA DE DETERMINACAO DE POLITICA OTIMA PARA SISTEMAS DE MANUTENCAO COM MAQUINAS DE RESERVA E NUMERO VARIAVEL DE SERVIDORES]
Samuel Roberto Ximenes Costa and Paulo Renato deMorais Mar. 1984 17 p refs In PORTUGUESE; ENGLISH summary Trabalho a ser submetido para apresentacao No. 17 Simposio Brasileiro de Pesquisa Operacional, a ser realizado no Rio de Janeiro, 7-9 Nov. 1984
(INPE-3132-PRE/523) Avail: NTIS HC A02/MF A01

A maintenance system in which the number of operating servers can be adjusted both at arrival and repair completion epochs is considered. The production system has a finite number of identical machines, each having an exponentially distributed lifetime, and a finite number of spares. After failure, a machine is replaced by a spare, if there is any available, and is sent to the repair facility. The repair facility has a finite number of independent servers available, each having an exponentially distributed service time. The cost structure includes a cost due to lost production, a holding cost, a repair cost, and a switch-over cost when the number of operating servers is adjusted. This control problem is represented by a semi-Markov decision model. The optimality criterion considered is the long-run average cost per unit time. A policy-iteration algorithm is used to compute the parameters of the optimal control policy within a particular subclass of the class of all stationary policies. Numerical results are given for the two-server case.
Author

N84-34313# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
AN OPTIMUM POLICY FOR A SYSTEM OF MAINTENANCE WITH CONTROL BY A REPAIR TIME DISTRIBUTION [UMA POLITICA O'TIMA PARA UM SISTEMA DE MANUTENCAO COM CONTROLE SOBRE A DISTRIBUICAO DO TEMPO DE REPARO]
Abdurahiman Vakulathil and Paulo Renato deMorais May 1984 17 p refs In PORTUGUESE; ENGLISH summary Presented at the 17th Simposio Brasileiro de Pesquisa Operacional, Rio de Janeiro, 7-9 Nov. 1984
(INPE-3131-PRE/522) Avail: NTIS HC A02/MF A01

A maintenance system in which the queue size at the repair facility is controlled by varying the repair time distribution is considered. The production system consists of a finite number of identical machines; they are subject to failure with an exponential time-to-failure distribution. Each failed machine is repaired at a single server repair facility by using one of two available repair time distributions. The cost structure includes a holding cost, a repair cost, and a fixed switch over cost when the repair time distribution is changed from one distribution to the other. This control problem is represented by a semi-Markov decision model in which the decision epochs are given by the repair completion epochs. The optimality criterion considered is the long run average cost per unit time. A policy iteration algorithm is used to compute the parameters of the optimal control policy within a particular subclass of the class of all stationary policies. Numerical results are given for an exponential repair time distribution. Author

N84-34314# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
HIERARCHICAL PLANNING SYSTEMS APPLIED TO PRODUCTION: A STUDY [SISTEMAS DE PLANEJAMENTO HIERARQUICO APLICADO A PRODUCAO: UM ESTUDO]
Jose Luiz Contador and Horacio Hideki Yanasse Jun. 1984 58 p refs In PORTUGUESE; ENGLISH summary Presented at the 4th Seminario ADUNESP, Guaratingueta, Brazil, 17-22 Oct. 1983
(INPE-3147-PRE/531) Avail: NTIS HC A04/MF A01

The theoretical development of hierarchical production planning systems is presented. Decisions related to production planning obey a hierarchy posed naturally by the organizational structure of the firm. Tactical decisions about production plans are taken by the high level management while the operational decisions and implementation of these plans are the concern of the lower levels management. The hierarchical approach adopts a set of hierarchic models to support tactical and operational decisions, conforming with the several management echelons of the firm. The output of the high level models are part of the input for the lower level models. The conception of the hierarchical planning system and some models available in the literature for its implementation are presented. Some limited computational results are also given. B.G.

N84-34315# Neilsen Engineering and Research, Inc., Mountain View, Calif.
RESEARCH ON TOPICS IN PERTURBATION METHODS, TRANSONIC FLOW THEORY, NUMERICAL ANALYSIS AND ADAPTIVE GRID GENERATION Final Report, 1 Apr. 1979 - 31 Jan. 1984
D. Nixon and G. H. Klopfer Apr. 1984 35 p
(Contract F49620-79-C-0054)
(AD-A143641; NEAR-TR-324; AFOSR-84-0548TR) Avail: NTIS HC A03/MF A01 CSCL 05/1

This report summarizes work performed during the period April 1, 1979 to January 31. The work is concerned with certain topics on perturbation theory, transonic flow theory, numerical analysis, and adaptive grid generation. GRA

N84-34316# Air Command and Staff Coll., Maxwell AFB, Ala.
MANAGING MICROCOMPUTERS: A SURVIVAL KIT FOR FUNCTIONAL MANAGERS
Emile C. Iverstine Apr. 1984 20 p
(AD-A144006; AD-E751074; ACSC-84-1345) Avail: NTIS HC A02/MF A01 CSCL 05/1

Military and civilian use of microcomputers has expanded at a phenomenal rate. Their popularity stems form the fact that they put computational power in the hands of users. But this capability presents new challenges to functional managers in the military

community because they now must manage their computational tools (microcomputers) as well as their work units. This article defines the microcomputer management environment facing functional managers and outlines some principles for meeting this challenge. Author (GRA)

N84-34317# Naval Postgraduate School, Monterey, Calif.
AN ANALYSIS OF THE EFFECTIVENESS OF THE PROBLEM SOLVING SKILLS FOR MANAGERS TRAINING PACKAGE--USCG M.S. Thesis
Dennis J. Ihnat Mar. 1984 137 p
(AD-A144017; AD-E751074) Avail: NTIS HC A07/MF A01 CSCL 05/1

This thesis examines the Problem Solving Skills for Managers training package, piloted by the Coast Guard Leadership and Management School in April 1983. Four questionnaire instruments developed by the company which produced the training package were analyzed to determine the effectiveness of the training program. A quasi-experimental pre-test/post-test/control group research design was used by the Coast Guard project manager and this thesis used a regression procedure to counter-act any regression effect. The results of the analysis suggest that the training program was not effective as given and suggests further study to determine why it was not effective. Author (GRA)

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software.*

N84-34318*# University of Southwestern Louisiana, Lafayette. Dept. of Computer Science.
NASA RECON: COURSE DEVELOPMENT, ADMINISTRATION, AND EVALUATION Final Report, FY 1983 - 1984
Wayne D. Dominick and Leroy Roquemore (Southern Univ., Baton Rouge, La.) 31 Aug. 1984 1697 p refs
(Contract NASw-3846)
(NASA-CR-173922; NAS 1.26:173922) Avail: NTIS HC A99/MF A01 CSCL 05B

The R and D activities addressing the development, administration, and evaluation of a set of transportable, college-level courses to educate science and engineering students in the effective use of automated scientific and technical information storage and retrieval systems, and, in particular, in the use of the NASA RECON system, are discussed. The long-range scope and objectives of these contracted activities are overviewed and the progress which has been made toward these objectives during FY 1983-1984 is highlighted. In addition, the results of a survey of 237 colleges and universities addressing course needs are presented. M.G.

N84-34319# Committee on Science and Technology (U. S. House).
THE ROLE OF INFORMATION TECHNOLOGY IN EMERGENCY MANAGEMENT
Washington GPO 1984 159 p Hearings before the Subcomm. on Invest. and Oversight of the Comm. on Sci. and Technol., 98th Congr., 1st Sess., No. 63, 16-17 Nov. 1983
(GPO-29-457) Avail: Subcommittee on Investigations and Oversight

The ability of the government to anticipate and respond to emergencies (crises) is assessed with emphasis on the adequacy of existing warning systems, ability to predict emergies, response time, and sufficiency of current technology. The Federal Emergency Management Agency (FEMA) is described and pertinent issues are discussed, including: The cooperative use of information technology by governmental agencies and the private sector; the value of simulating emergency situations; establishment and utilization of analyst work stations; the current effectiveness of emergency operation centers; and other public policy issues. S.B.

N84-34320# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
CATALOG OF EXISTING PUBLISHED PERIODICALS OF INPE, VOLUME 7 [CATALOGO DAS PUBLICACOES PERIODICAS EXISTENTES NO INPE - VOL. VII]
Sonia Maria dePaula Spilak Sep. 1983 129 p refs In PORTUGUESE; ENGLISH summary
(INPE-2886-NTE/206) Avail: NTIS HC A07/MF A01

The objective of this catalog is to give the user of the INPE library knowledge of the mass of published periodicals existing at the institute. Author

N84-34321*# National Aeronautics and Space Administration, Washington, D. C.
MASTER LIST AND INDEX TO NASA DIRECTIVES
1 Aug. 1984 81 p
(NASA-TM-87362; NGB-1410.4JJ; NAS 1.15:87362) Avail: NTIS HC A05/MF A01 CSCL 05B

All NASA management directives in force as of August 1, 1984 are listed by major subject headings showing number, effective date, title, responsible office, and distribution code. Delegations of authority in print by that date are listed numerically as well as by the installation or office to which special authority is assigned. Other consolidated lists show all management handbooks, directives applicable to the Jet Propulsion Laboratory, directives published in the Code of Federal Regulations, complementary manuals, and NASA safety standards. Distribution policies and instructions for ordering directives are included. A.R.H.

N84-34322# Naval Civil Engineering Lab., Port Hueneme, Calif.
GUIDE TO TECHNICAL DOCUMENTS. VOLUME 2: JANUARY 1983 THROUGH DECEMBER 1983
Dec. 1983 60 p
(AD-A143596) Avail: NTIS HC A04/MF A01 CSCL 05/2

This Guide to Technical Documents lists all the formal reports that have been published by NCEL on research, test, and evaluation. These reports are available to addresses from the following sources: Unclassified, unlimited documents - available to general public, National Technical Information Service (NTIS); Classified and limited distribution documents - available to Department of Defense agencies and their contractors only; Defense Technical Information Center (DTIC). GRA

N84-34323# Naval Postgraduate School, Monterey, Calif.
THE SIMULATION OF A MAJOR AUTOMATED INFORMATION SYSTEM (AIS) ON A MICROCOMPUTER M.S. Thesis
K. V. Lockett and M. E. ONeil Mar. 1984 188 p
(AD-A143599) Avail: NTIS HC A09/MF A01 CSCL 09/2

The objective of this thesis is to determine if a mainframe computer Automated Information System can be simulated on a conventional microcomputer. To this end, the topical areas of software, hardware, the simulation development lifecycle, and systems testing and evaluation are explored in-depth. The purpose of this in-depth subject area examination is to demonstrate the tradeoffs and decision points encountered in the systems management lifecycle. Recommendations based upon these tradeoffs and decisions are then presented. Lastly, the conclusions address the attainment of the thesis objective. Author (GRA)

N84-34324# Mitre Corp., Bedford, Mass.
SOFTWARE SUPPORT FOR A VIDEO DISC BASED TERRAIN MAP DISPLAY SYSTEM
Kevin Ilsen Griffiss AFB, N.Y. RADC Mar. 1984 111 p
(Contract F19628-82-C-0001)
(AD-A143700; MTR-8828; RADC-TR-83-184) Avail: NTIS HC A06/MF A01 CSCL 05/2

The large capacity and random access capability of optical scan video discs make them an excellent storage medium for background maps used in tactical situation displays. Early experience with paper map photographs on video discs revealed serious resolution and clutter problems when these maps are overlaid with intelligence symbology. To improve the displays, the Video Frame Store (VFS) was built. The VFS can load a series of video

disc frames, each containing an image of an individual feature, which together form a composite map of the area of interest. Once the images have been loaded, they can be manipulated digitally by microcode programs in the VFS. This paper describes the support software which was written to turn the video disc and the VFS into a full-scale terrain map display system. Three interactive software packages are described in detail, with full user manuals in the appendices. The data base structure for map applications is described, as well as the video disc layout. Also included are projections of short term and long term plans to continue these efforts, and a general survey of commercially available devices with features comparable to the Video Frame Store. Author (GRA)

N84-34325# Defense Technical Information Center, Alexandria, Va.
SOURCE HEADER LIST, SUPPLEMENT 2 Annual Report, Jun. 1983 - May 1984
J. P. Burrell Jul. 1984 342 p
(AD-A143800; DTIC/TR-84/8-Suppl-2) Avail: NTIS HC A15/MF A01 CSCL 05/2

This publication is a one volume, alphabetically arranged, compilation of corporate author names used by the Defense Technical Information Center since April 1982. It is a supplement to the two volume Source Header List (AD-A115 000, AD-A115 001). Taken together these three volumes contain all corporate source names in the DTIC database system. Each source name is assigned a 6-digit numeric code for computer input and retrieval purposes plus a 4-digit alphanumeric geopolitical code and an alphanumeric type code. Source names displayed are included as data elements in the Technical Report, Work Unit Information System, Research and Development Program Planning, and Independent Research and Development databases maintained by DTIC. Author (GRA)

N84-34326# Naval Postgraduate School, Monterey, Calif.
THE CREATION OF A CENTRAL DATABASE ON A MICROCOMPUTER NETWORK M.S. Thesis
J. G. Boynton and R. G. Nichols Mar. 1984 219 p
(AD-A143875) Avail: NTIS HC A10/MF A01 CSCL 09/2

This thesis discusses the design and development of a central database on a network of microcomputers. It provides an overview of the methodology utilized in creating the system, along with the problems associated with a central database. The thesis includes the source listings for the creation of the system and a discussion of the difficulties of controlling contention within the networked database environment. Author (GRA)

N84-34327# Defense Technical Information Center, Alexandria, Va.
DTIC 2000: A CORPORATE PLAN FOR THE FUTURE Final Report
R. D. Douglas, E. V. McCauley, A. D. Kuhn, J. L. Bell, and K. W. Woolridge Jul. 1984 115 p Original contains color illustrations (AD-A143900; DTIC/TR-84/3) Avail: NTIS HC A06/MF A01 CSCL 05/2

This report documents the corporate level long-range plan for the Defense Technical Information Center (DTIC). The plan describes the societal and DoD environments within which DTIC will most likely operate over the next 15-20 years. It relates these future environments to meaningful long-range goals for DTIC. The particular areas highlighted in the plan are Products and Services; Personnel; and Finance and Budget. Author (GRA)

N84-34328# ADR Services, Inc., Vienna, Va.
ON-LINE EDIT USERS MANUAL
1 Aug. 1983 111 p
(Contract DAAK70-80-C-0127)
(AD-A144021; AD-E751074) Avail: NTIS HC A06/MF A01 CSCL 09/2

The purpose of this manual is to provide a reference guide for field users of the Army's On-Line-Edit system (OLE) for DD Form 1498. The purpose of the Army OLE system is to provide Army elements a method to input remotely their research and technology work unit summaries. The system provides edit critieria for the input of research and development (AR 70-9), studies and analyses (AR 5-5) or management analytical support services (AR 5-14) to insure that data is inserted into the OLE system in the proper format for subsequent retrieval and use. It is assumed that readers are familiar with AR 70-91, AR 5-52, and AR 5-143, the resulation documents used in preparation of the Army's DD Form 1498. Only unclassified work units will be entered into the OLE system. Any attempt to enter other than a U in the DD Form 1498 Summary Security field (field 5) will result in an error message. Classified data for ARs 70-9, 5-5 or 5-14 will be submitted on the DD Form 1498 to the address designated in AR 70-9.
Author (GRA)

N84-33709# Tohoku Univ., Sendai (Japan).
THE DESIGN OF AN ENGLISH WORD-PROCESSOR FOR SCIENTIFIC AND TECHNICAL USE IN WHICH SUPERSCRIPTS, SUBSCRIPTS AND GREEK CHARACTERS ARE OPERATED IN ONE-TOUCH, 1
In its The Record of Elec. and Commun. Eng. Conversazione, Vol. 52, No. 3, Feb. 1984 Feb. 1984 p 82-93 refs In JAPANESE (For primary document see N84-33707 23-33)
Avail: NTIS HC A04/MF A01

N84-33710# Tohoku Univ., Sendai (Japan).
THE DESIGN OF AN ENGLISH WORD-PROCESSOR FOR SCIENTIFIC AND TECHNICAL USE IN WHICH SUPERSCRIPTS, SUBSCRIPTS AND GREEK CHARACTERS ARE OPERATED IN ONE-TOUCH, 2
Susumu Mashiko and Shigetoshi Katsura *In its* The Record of Elec. and Commun. Eng. Conversazione, Vol. 52, No. 3, Feb. 1984 Feb. 1984 p 94-100 refs In JAPANESE; ENGLISH summary (For primary document see N84-33707 23-33)
Avail: NTIS HC A04/MF A01

N84-33997*# European Space Agency, Paris (France). Earthnet.
EUROPEAN PLANS FOR HANDLING OFF-LINE TASKS OF THE ERS-1
L. Marelli, A. Haskell (RAE, Farnsborough, Engl.), J. Gredel (DFVLR, West Germany), and Stanislas (Centre National pour l'Exploitation des Oceans, France) *In* ESA IGARSS 84 Remote Sensing: From Res. Towards Operational Use, Vol. 2 Aug. 1984 p 877-880 (For primary document see N84-33946 23-43)
Avail: NTIS HC A15/MF A01 CSCL 05B

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

No abstracts in this category.

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

N84-34329# Committee on Science and Technology (U. S. House).
COMMERCIAL SPACE LAUNCH ACT
Washington GPO 1984 25 p Rept. to accompany H. R. 3942 presented by the Comm. on Sci. and Technol., 98th Congr., 2nd Sess., 31 May 1984
(H-Rept-98-816; GPO-31-006) Avail: US Capitol, House Document Room

A congressional report of a bill which provides for the commercialization of expendable launch vehicles and associated services is presented. The bill provides for the promotion of

economic growth in the United States by encouraging the private sector to provide space launch services and the utilization of space for peaceful purposes; the simplification and expedition of the process of licensing commercial launch operations and the facilitation of commercial application of government developed space technology; and the assignment of the principal responsibility to a single agency in the Executive Branch (DOT) the promotion and supervision of commercial launch operations and for the issuance and enforcement of licenses to conduct such activities.
E.R.

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

N84-34330*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
BASELINE PERFORMANCE AND EMISSIONS DATA FOR A SINGLE-CYLINDER, DIRECT-INJECTED DIESEL ENGINE Final Report
Robert A. Dezelick, John J. McFadden, Lloyd W. Ream, and Richard F. Barrows Sep. 1983 67 p refs
(Contract DE-AI01-80CS-50194)
(NASA-TM-86873; DOE/NASA/50194-38; E-2079; NAS 1.15:86873) Avail: NTIS HC A04/MF A01 CSCL 13F

Comprehensive fuel consumption, mean effective cylinder pressure, and emission test results for a supercharged, single-cylinder, direct-injected, four-stroke-cycle, diesel test engine are documented. Inlet air-to-exhaust pressure ratios were varied from 1.25 to 3.35 in order to establish the potential effects of turbocharging techniques on engine performance. Inlet air temperatures and pressures were adjusted from 34 to 107 C and from 193 to 414 kPa to determine the effects on engine performance and emissions. Engine output ranged from 300 to 2100 kPa (brake mean effective pressure) in the speed range of 1000 to 3000 rpm. Gaseous and particulate emission rates were measured. Real-time values of engine friction and pumping loop losses were measured independently and compared with motored engine values. Author

N84-34331*# Garrett Turbine Engine Co., Phoenix, Ariz.
HIGH TEMPERATURE CERAMIC INTERFACE STUDY Final Report
Laura J. Lindberg Aug. 1984 112 p refs
(Contracts DEN3-324; DE-AI01-80CS-50194)
(NASA-CR-174728; NAS 1.26:174728; GTEC-31-5738) Avail: NTIS HC A06/MF A01 CSCL 11B

Monolithic SiC and Si3N4 are susceptible to contact stress damage at static and sliding interfaces. Transformation-toughened zirconia (TTZ) was evaluated under sliding contact conditions to determine if the higher material fracture toughness would reduce the susceptibility to contact stress damage. Contact stress tests were conducted on four commercially available TTZ materials at normal loads ranging from 0.455 to 22.7 kg (1 to 50 pounds) at temperatures ranging from room temperature to 1204C (2200 F). Static and dynamic friction were measured as a function of temperature. Flexural strength measurements after these tests determined that the contact stress exposure did not reduce the strength of TTZ at contact loads of 0.455, 4.55, and 11.3 kg (1, 10, and 25 pounds). Prior testing with the lower toughness SiC and Si3N4 materials resulted in a substantial strength reduction at loads of only 4.55 and 11.3 kg (10 and 25 pounds). An increase in material toughness appears to improve ceramic material resistance to contact stress damage. Baseline material flexure strength was established and the stress rupture capability of TTZ was evaluated. Stress rupture tests determined that TTZ materials are susceptible to deformation due to creep and that aging of TTZ materials at elevated temperatures results in a reduction of material strength.
R.J.F.

88 SPACE SCIENCES (GENERAL)

N84-34332*# Maryland Univ., College Park.
SOLAR TERRESTRIAL PHYSICS: PRESENT AND FUTURE
D. M. Butler, ed. and K. Papadopoulos, ed. Jun. 1984 586 p refs Workshop held in Berkeley Springs, W. Va., Dec. 1982, 6-10 Jun. and 30 Nov. 1983 Sponsored in cooperation with NASA and NSF
(NASA-RP-1120; NAS 1.61:1120) Avail: NTIS HC A25/MF A01 CSCL 03B

The following topics relating to solar-terrestrial interactions are considered: (1) reconnection of magnetic fields; (2) particle acceleration; (3) solar magnetic flux; (4) magnetohydrodynamic waves and turbulence in the Sun and interplanetary medium; (5) coupling of the solar wind to the magnetosphere; (6) coronal transients; (7) the connection between the magnetosphere and ionosphere; (8) substorms in the magnetosphere; (9) solar flares and the solar terrestrial environment; (10) shock waves in the solar terrestrial environment; (11) plasma transport and convection at high latitudes; and (12) high latitude ionospheric structure. For individual titles, see N84-34333 through N84-34344.

N84-34333*# Maryland Univ., College Park.
RECONNECTION OF MAGNETIC FIELDS **c90**
In its Solar Terrest. Phys. Jun. 1984 71 p refs (For primary document see N84-34332 23-88)
Avail: NTIS HC A25/MF A01 CSCL 03B

Spacecraft observations of steady and nonsteady reconnection at the magnetopause are reviewed. Computer simulations of three-dimensional reconnection in the geomagnetic tail are discussed. Theoretical aspects of the energization of particles in current sheets and of the microprocesses in the diffusion region are presented. Terrella experiments in which magnetospheric reconnection is simulated at both the magnetopause and in the tail are described. The possible role of reconnection in the evolution of solar magnetic fields and solar flares is discussed. A two-dimensional magnetohydrodynamic computer simulation of turbulent reconnection is examined. Results concerning reconnection in Tokamak devices are also presented.
R.S.F.

N84-34334*# Maryland Univ., College Park.
PARTICLE ACCELERATION **c90**
In its Solar Terrest. Phys. Jun. 1984 52 p refs (For primary document see N84-34332 23-88)
Avail: NTIS HC A25/MF A01 CSCL 03B

A phenomenological account of particle acceleration is provided along with a detailed summary of the current status of theoretical studies of particle acceleration. Problems are presented which remain when specific mechanisms and observations are confronted. The following specific topics are addressed: solar particle acceleration, interplanetary particle acceleration, and extrasolar particle acceleration.
R.S.F.

N84-34335*# Maryland Univ., College Park.
EVOLUTION OF SOLAR MAGNETIC FLUX **c92**
In its Solar Terrest. Phys. Jun. 1984 32 p refs (For primary document see N84-34332 23-88)
Avail: NTIS HC A25/MF A01 CSCL 03B

The appearance of solar magnetic flux is discussed; both the mechanisms and phenomena associated with flux emergence are considered. The dynamics of solar surface magnetic flux are addressed, including both the transport and structure of magnetic-flux-carrying elements as seen in the chromosphere and corona. The disappearance of magnetic flux from the surface of the Sun is also discussed. Standard solar models representing generally

accepted views are considered along with observations which seem to fall outside the scope of these models. R.S.F.

N84-34336*# Maryland Univ., College Park.
MHD WAVES AND TURBULENCE IN THE SUN AND INTERPLANETARY MEDIUM **c92**
In its Solar Terrest. Phys. Jun. 1984 19 p refs (For primary document see N84-34332 23-88)
Avail: NTIS HC A25/MF A01 CSCL 03B

The existence, nature, and dynamics of magnetohydrodynamic waves and turbulence in the solar atmosphere and interplanetary medium are addressed. Remote sensing observations of global oscillations of the Sun and their possible interpretation in terms of waves or turbulence are considered. The region of solar wind acceleration as described by coronal imaging, resonance-line spectrometry, and radio techniques is discussed. Fluctuations and discontinuities in the interplanetary medium are considered using primary data collected by spaceborne magnetometers and plasma analyzers. R.S.F.

N84-34337*# Maryland Univ., College Park.
COUPLING OF THE SOLAR WIND TO THE MAGNETOSPHERE **c92**
In its Solar Terrest. Phys. Jun. 1984 23 p refs (For primary document see N84-34332 23-88)
Avail: NTIS HC A25/MF A01 CSCL 03B

Solar wind-magnetosphere coupling is considered in the context of four major questions. The first of these questions is concerned with the process of solar wind plasma entry. The processes of energy and momentum transfer from the solar wind to the magnetosphere comprise the focus of the second question. The third question deals with the physics of magnetospheric boundary layers, specifically their role as generators, loads, and plasma transport regions. The final question concerns the global magnetohydrodynamics that characterize the magnetosphere for the various coupling processes and as functions of solar wind parameters. R.S.F.

N84-34338*# Maryland Univ., College Park.
CORONAL TRANSIENTS AND THEIR INTERPLANETARY EFFECTS **c92**
In its Solar Terrest. Phys. Jun. 1984 30 p refs (For primary document see N84-34332 23-88)
Avail: NTIS HC A25/MF A01 CSCL 03B

The role of coronal mass ejections in the context of solar-terrestrial physics is examined. Some of the necessary background material on flares and geomagnetic storms, on interplanetary shock waves, and on coronal mass ejections is described. One of the modern tools available for approaching these questions - theoretical models for the initiation and propagation of transient phenomenon in the solar corona is described. All of this material was extensively reviewed in the recent literature, and the coverage of it is both selective and somewhat abbreviated. The second of the tools - a new generation of coronagraph observation of mass ejections and complementary set of solar and interplanetary observations suitable for correlative studies, is described. Important problems to be solved in answering these questions and some suggested strategies for approaching these problems will be discussed. B.G.

N84-34339*# Maryland Univ., College Park.
CONNECTION BETWEEN THE MAGNETOSPHERE AND IONOSPHERE **c46**
In its Solar Terrest. Phys. Jun. 1984 46 p refs (For primary document see N84-34332 23-88)
Avail: NTIS HC A25/MF A01 CSCL 04A

Two decades of space research have produced ample evidence that particles and fields originating in the active Sun can gain entry into the terrestrial magnetosphere and deposit their energy in the ionosphere and atmosphere. The final link in this solar-terrestrial chain is generically referred to as magnetosphere-ionosphere coupling (MIC). Because of the far-reaching implications of recent discoveries in MIC and because a coherent assessment of them has yet to be made, the principal task is to critically assess these new observations and the new perspectives that they may engender. The MIC topics of interest are roughly grouped according to the scale lengths of the phenomena being treated. This particular choice of groupings is mainly for convenience, with perhaps some suggestion as to the direction of energy cascade from the largest scales down to the smaller scale. B.G.

N84-34340*# Maryland Univ., College Park.
SUBSTORMS IN THE MAGNETOSPHERE **c46**
In its Solar Terrest. Phys. Jun. 1984 53 p refs (For primary document see N84-34332 23-88)
Avail: NTIS HC A25/MF A01 CSCL 04A

A working definition of substorms was provided, the primary relationships within the solar wind-magnetosphere-ionosphere system as related to substorms was considered, and the role substorm studies play in the overall discipline of solar-terrestrial research was clarified. The question of which aspects of magnetospheric activity are directly driven by solar wind and which aspects of this activity represented an unloading process for previously stored solar wind energy were examined. B.G.

N84-34341*# Maryland Univ., College Park.
IMPACT OF FLARES ON THE SOLAR TERRESTRIAL ENVIRONMENT **c92**
In its Solar Terrest. Phys. Jun. 1984 38 p refs (For primary document see N84-34332 23-88)
Avail: NTIS HC A25/MF A01 CSCL 03B

The current knowledge of the flare process and its particle and photon emissions is summarized. The impact of flares on the different regions of the solar-terrestrial environment, in order of their distance from the Sun to Earth: the heliosphere, the magnetosphere, the ionosphere, and atmosphere are considered. The effect of flares on modern technology and manned spaceflight is described. In all cases, an attempt is made to distinguish clearly what is known, what is suspected, and is unknown. B.G.

N84-34342*# Maryland Univ., College Park.
COLLISIONLESS SHOCK WAVES IN THE SOLAR TERRESTRIAL ENVIRONMENT **c93**
In its Solar Terrest. Phys. Jun. 1984 58 p refs (For primary document see N84-34332 23-88)
Avail: NTIS HC A25/MF A01 CSCL 03B

Natural shocks, magnetohydrodynamics, shock extensions, global asymmetries, shock profiles, quasiperpendicular supercritical process; ion dynamics and field structure, numerical simulations, ion reflection machinery, electrons, instabilities, phenomenology, and ion acceleration were described. B.G.

N84-34343*# Maryland Univ., College Park.
ASSESSMENT OF PLASMA TRANSPORT AND CONVECTION AT HIGH LATITUDES **c46**
In its Solar Terrest. Phys. Jun. 1984 34 p refs (For primary document see N84-34332 23-88)
Avail: NTIS HC A25/MF A01 CSCL 04A

The high-latitude ionosphere is strongly coupled to the thermosphere and magnetosphere. The magnetospheric coupling occurs via electric fields, field-aligned currents, and particle precipitation. Owing to the interaction of the shocked solar wind with the geomagnetic field, an electric potential difference is generated across the tail of the magnetosphere, with the resulting electric field pointing from dawn to dusk. Energetic particle precipitation from the magnetosphere in the auroral region leads to the creation of ionization and to electron, ion, and neutral gas heating. In order to assess the current understanding of plasma transport and convection at high latitudes, it is necessary to take account of the strong coupling between the ionosphere, thermosphere, and magnetosphere. B.G.

N84-34344*# Maryland Univ., College Park.
HIGH LATITUDE IONOSPHERIC STRUCTURE **c46**
In its Solar Terrest. Phys. Jun. 1984 37 p refs (For primary document see N84-34332 23-88)
Avail: NTIS HC A25/MF A01 CSCL 04A

The Earth's ionosphere is an important element in solar-terrestrial energy transfer processes. As a major terrestrial sink for many solar and magnetospheric events, the ionosphere has characteristic features that are traced to such seemingly remote phenomena as solar flares, radiation belt wave-particle interactions and magnetospheric substorms. In considering the multiple of solar-terrestrial plasma interactions, it is important to recognize that the high-latitude ionosphere is not altogether a simple receptor of various energy deposition processes. The high-altitude ionosphere plays an active feedback role by controlling the conductivity at the base of far-reaching magnetic field lines and by providing a plasma source for the magnetosphere. Indeed, the role of the ionosphere during magnetospheric substorms is emerging as a topic for meaningful study in the overall picture of magnetospheric-ionospheric coupling. Author

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N84-34345 California Univ., Berkeley.
HLL REGIONS IN THE OUTER GALAXY Ph.D. Thesis
Michael Fick 1983 85 p
Avail: Univ. Microfilms Order No. DA8413377

Radio continuum surveys are used to search for HLL regions in the outer Galaxy. Possible new HLL regions are checked with observations of a radio recombination line (H109 alpha). The results indicate that essentially all strong (high excitation) HLL regions in the outer Galaxy are visible optically. The distribution of optical HLL regions in the outer Galaxy is found as a function of galactic radius and in the direction perpendicular to the galactic plane. Optical distances are used where available. Evidence is presented which indicates that the efficiency of the formation of the most massive stars decreases at larger galactocentric distances but, various selection effects make it difficult to discriminate between the decrease in the numbers of the strongest HLL regions and the decrease in the numbers of all HLL regions at large distances. Dissert. Abstr.

N84-34346 Stanford Univ., Calif.
CONCEPT AND DESIGN STUDIES FOR THE EXPLORATION OF HIGH ENERGY GAMMA RAY ASTRONOMY ON THE GAMMA RAY OBSERVATORY Ph.D. Thesis
Lorna Campbell Finman 1984 277 p
Avail: Univ. Microfilms Order No. DA8412841

The EGRET high energy gamma-ray telescope is one of four instruments to be included on the Gamma Ray Observatory mission, a Shuttle-launched free-flying satellite scheduled for launch in the late 1980's. This instrument, a spark chamber telescope with a NaI(Tl) crystal energy spectrometer, will cover the energy range from 12 MeV to 24,000 MeV, with much better sensitivity and spectral and spatial resolution than any previous experiment in this energy range. The design and performance of the EGRET instrument, with particular reference to those components that are the responsibility of Stanford University are described. Dissert. Abstr.

N84-34347*# California Univ., Santa Cruz.
HIGH ENERGY TRANSIENTS Final Technical Report, 1 Jul. 1983 - 30 Jun. 1984
Stanford E. Woosley 24 Sep. 1984 8 p Presented at the Summer Workshop in Astronomy and Astrophys., Santa Cruz, Calif., 11-22 Jul. 1983
(Grant NAGw-475)
(NASA-CR-173944; NAS 1.26:173944) Avail: NTIS HC A02/MF A01 CSCL 03A

A meeting was convened on the campus of the University of California at Santa Cruz during the two-week interval July 11 through July 22, 1983. Roughly 100 participants were chosen so as to give broad representation to all aspects of high energy transients. Ten morning review sessions were held in which invited speakers discussed the current status of observations and theory of the above subjects. Afternoon workshops were also held, usually more than one per day, to informally review various technical aspects of transients, confront shortcomings in theoretical models, and to propose productive courses for future research. Special attention was also given to the instrumentation used to study high energy transient and the characteristics and goals of a dedicated space mission to study transients in the next decade were determined. A listing of articles written by various members of the workshop is included. S.B.

N84-34348*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A SEARCH FOR 183-GHz EMISSION FROM WATER IN LATE-TYPE STARS
T. B. H. Kuiper, P. N. Swanson, D. F. Dickinson, E. N. Rodriguez Kuiper, and P. Zimmerman Aug. 1984 20 p refs Submitted for publication
(NASA-TM-85987; A-9825; NAS 1.15:85987) Avail: NTIS HC A02/MF A01 CSCL 03A

A search was made for 183 GHz line emission from water vapor in the direction of twelve Mira and two semiregular variables. Upper limits to the emission are in the range of 2000 to 5000 Jy. It is estimated that thermal emission from the inner regions of late type stellar envelopes will be on the order of ten Jy. Maser emission, according to one model, would be an order of magnitude stronger. From the limited set sampled, the possibility of very strong maser emission at 183 GHz cannot yet be ruled out. Author

N84-34349*# California Univ., Berkeley.
SEARCH FOR EMISSION LINES IN THE GASEOUS HALO OF EDGE-ON GALAXIES Final Status Report
Jay Bixler 28 Sep. 1984 2 p
(Grant NAG5-69)
(NASA-CR-173968; NAS 1.26:173968) Avail: NTIS HC A02/MF A01 CSCL 03A

Careful reductions of the short wave prime camera (SWP) spectrum was carried out. A line by line inspection of the spectrum was used to eliminate spurious spikes and a median filter applied to eliminate high frequency noise. Upper limits were obtained for far ultraviolet emission from a hot galactic halo. Author

N84-34350# Committee on Science and Technology (U. S. House).
SPACE TELESCOPE, 1984
Washington GPO 1984 166 p Hearings before the Subcomm. on Space Sci. and Appl. of the Comm. on Sci. and Technol., 98th Congr., 2nd Sess., No. 90, 22 and 24 May 1984
(GPO-37-290) Avail: Subcommittee on Space Science and Applications

The requirements and operational possibilities of the Space Telescope (ST) are presented, along with the functions of the Space Telescope Science Institute, which are: Planning the scientific program for ST; participating with the NASA project in trade off decisions; and monitoring the ST performance. Most important, the relationships of the ST to the scientific community, the relationship of the scientific community to the Space Telescope Science Institute, and how the use of the ST will be apportioned, are discussed. Assistance of the astronomers from other countries is sought in identifying key projects for the ST. The cost of the ST, with the scientific, assembly, and test problems, are also given. The interaction of the ST with the Space Transportation System is detailed. S.B.

N84-34351*# Auburn Univ., Ala. Dept. of Physics.
SURFACE ANALYSIS OF SPACE TELESCOPE MATERIAL SPECIMENS Monthly Report
Albert Thomas Fromhold, Jr. 31 Jul. 1984 70 p
(Contract NAS8-35914)
(NASA-CR-171163; NAS 1.26:171163) Avail: NTIS HC A04/MF A01 CSCL 03A

Surface analysis by electron spectroscopy for chemical analysis

(ESCA) was used to characterize a number of the material samples for the space telescope. With ESCA, the sample is irradiated with monoenergetic soft X-rays and the resulting emitted electrons are energy analyzed to determine the binding energy of electrons to the surface atoms. The major peaks were used in the quantitative determination of the surface composition. The presence of trace elements (impurities below 1% atomic composition) was also detailed. Initially a survey scan was run for each sample to deduce the elemental composition. Then the major peaks of interest and those of the trace elements were individually examined. After this, the samples were argon sputtered to etch away surface layers, and then additional measurements were carried out in order to obtain depth profile information. In this way it was possible for those species present only on the surface to be distinguished from those having a significant depth distribution within the sample. Author

N84-34352# Los Alamos Scientific Lab., N. Mex.
CEPHEID EVOLUTION
Stephen A. Becker May 1984 23 p refs Presented at the IAU Colloq. on Cepheid Variables, Toronto, 29 May 1984
(Contract W-7405-eng-36)
(DE84-014027; LA-UR-83-1996; CONF-8405180-4) Avail: NTIS HC A02/MF A01

The phases of stellar evolution relevant to Cepheid variables of both types I and II are reviewed. Type I Cepheids arise as a result of normal post-main sequence evolutionary behavior of many stars in the intermediate to massive range of stellar masses. In contrast, type II Cepheids generally originate from low-mass stars of low metallicity which are undergoing post core helium-burning evolution. Despite great progress in the past two decades, uncertainties still remain in such areas as how to best model convective overshoot, semiconvection, stellar atmospheres, rotation, and binary evolution as well as uncertainties in important physical parameters such as the nuclear reaction rates, opacity, and mass loss rates. The potential effect of these uncertainties on stellar evolution models is discussed. Finally, comparisons between theoretical predictions and observations of Cepheid variables are presented for a number of cases. The results of these comparisons show both areas of agreement and disagreement. DOE

N84-34353# Los Alamos Scientific Lab., N. Mex.
SECULAR STABILITY OF ROTATING STARS
Jim N. Imamura, John L. Friedman (Wisconsin Univ., Milwaukee), and Richard H. Durisen (Indiana Univ., Bloomington) 1984 10 p refs Presented at the workshop on the Millisec. Pulsar, Green Bank, W. Va., 6-8 Jun. 1984
(Contract W-7405-eng-36)
(DE84-014011; LA-UR-84-2088; CONF-8406151-1) Avail: NTIS HC A02/MF A01

The secular stability limits of rotating polytropes to nonaxisymmetric perturbations of low m are calculated. Polytropic indices ranging from one to three and several angular momentum distributions are considered. Results are presented in terms of the t-parameter, defined as the ratio of the rotational kinetic energy to the absolute value of the gravitational energy of the fluid. Previous work on polytropes considered only the m = 2 mode, which is unstable for values of the t-parameter greater than 0.14 + or - 0.01 for the n values n = 1.5 and 3 and the angular momentum distributions tested. The Gravitational Radiation Reaction (GRR) secular stability limit of the m = 2 mode for the Maclaurin spheroids (n = O) was determined previously; GRR stability limits of higher m modes for the Maclaurin spheroids were also located prior to this work. DOE

N84-34354# MATRA Service Aerodynamique, Toulouse (France). Dept. d'Etudes et Avant Projet Systeme.
STATISTICAL METHOD FOR THE CALCULATION OF THE COVERAGE OF THE CELESTIAL SPHERE INCLUDING SUN, MOON AND EARTH CONSTRAINTS (ANALYSIS DOCUMENT)
J. C. Flandrin and J. G. Ferrante Paris ESA Feb. 1984 54 p
(Contract ESOC-5335/83/D-JS(SC))
(MATRA-CMT-RT101/016; ESA-CR(P)-1887) Avail: NTIS HC A04/MF A01

A method for computing the percentages of observation time of the celestial sphere from an orbiting telescope, including the dazzling constraints due to the Sun, the Moon, the Earth and the communication constraints with the ground station network was developed. The method replaces a deterministic time dependent problem by a statistical problem, the time being considered as a uniformly distributed random variable. Time-dependent variables are considered as random variables and their probability density functions are derived to calculate the probability of occurrence of events of interest. Results are similar to those of simulation methods, but require only a few minutes of run time on a VAX 780, regardless of mission duration. Author (ESA)

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N84-34355 Pittsburgh Univ., Pa.
THE DETERMINATION OF FREQUENCIES AND MASS CHARACTERISTICS OF BINARY STARS IN OPEN CLUSTERS Ph.D. Thesis
Jan Paul Dabrowski 1983 80 p
Avail: Univ. Microfilms Order No. DA8411621

Frequencies of binary stars have been determined from surveys of the various binary types: visual, astrometric, spectroscopic and eclipsing systems. Selection effects tend to make the duplicity estimates incomplete. In order to determine the frequency of binaries in open clusters, and to determine which stars in a cluster are possibly binary in nature, a technique was developed that analyzes cluster star multi-color photometry for the purpose of detecting unresolved binary stars along the main sequence. The technique compares a series of hypothetical primaries and secondaries (by way of magnitude and colors in the BVRI system) to the observed cluster star. This yields a probable set of components for the suspected binary. The technique was tested on several model clusters. Variations in mass ratio distributions and observational errors resulted in ten clusters, each having a binary frequency of 50%. The distribution of mass ratios for binaries detected by the computer technique is roughly inversely dependent on the mass ratio. The technique and its restrictions are discussed, as are the results of the technique's application to the model and actual open clusters. Dissert. Abstr.

N84-34356 Johns Hopkins Univ., Baltimore, Md.
ULTRAVIOLET STUDIES OF INTERSTELLAR MATTER Ph.D. Thesis
Wayne Brian Landsman 1984 142 p refs
Avail: Univ. Microfilms Order No. DA8414292

Two investigations using ultraviolet instrumentation, primarily concerned with interstellar matter are studied. High resolution spectroscopy at Lyman apha is used to determine the distribution of hydrogen and deuterium in the immediate solar neighborhood. Ultraviolet stellar photometry is used to supplement previous wide field of view observations, to obtain information on diffuse galactic light and the cosmic ultraviolet background. The Copernicus was used to obtain detections of Ly alpha emission from two stars within 5 pc of the Sun, 70 Oph A and Altair, and to obtain limits of n (sub H) < 0.45/cubic cm and n (sub H) < 0.11/cubic cm along the respective line of sights. The Altair spectrum complements a spectrum obtained with the International Ultraviolet Explorer (IUE) and provides evidence for a chromosphere in an A-type star. Dissert. Abstr.

N84-34357 California Univ., Berkeley.
THE STRUCTURE, INTERNAL KINEMATICS AND DYNAMICS OF OPEN STAR CLUSTERS Ph.D. Thesis
Robert David Mathieu 1983 304 p
Avail: Univ. Microfilms Order No. DA8413499

The structure and internal kinematics of three rich open clusters are studied--two young clusters, M11 and M35, and the old cluster M67. Luminosity functions and total masses are obtained. radial surface-density profiles are presented as a function of stellar mass. The radial distribution of red giants in M11 and M67 are more extended than the main sequence turn-off stars. Blue stragglers in M67 are centrally concentrated. The binary distribution in the Hyades is studied in detail, using high-precision spectroscopic data and published spectroscopic, visual and proper-motion data. The frequency of binaries is at least 50%. In all characteristics studied the binary population of the Hyades is indistinguishable from that in the field. The binary population of the Hyades is used as a model to study the effects of binary orbital motions on the determination of cluster internal motions with radial velocities. Binaries are found to cause significant confusion, greatly distorting the observed rms velocity from the actual cluster velocity dispersion. High-precision radial velocities are obtained for approximately 30 stars in each of M67 and M11. Dissert. Abstr.

N84-34358 California Univ., Berkeley.
STELLAR WINDS AND THEIR DYNAMICAL INFLUENCE ON THE INTERSTELLAR MEDIUM Ph.D. Thesis
Dave VanBuren 1983 158 p
Avail: Univ. Microfilms Order No. DA8413615

An inventory of mass loss for stars with M > 3 M sub 0 was performed. The global and local rates of mass, momentum, and energy input into the interstellar medium (ISM) via energetic winds were assessed in order to determine the importance of stellar winds in the dynamics and evolution of the ISM. Necessary in finding the initial mass function and global mass loss and energy injection rates are calibrations of spectral type and luminosity class versus luminosity, mass, age, mass loss rate, and wind velocity. These were found using published data, and in some cases, portions of published calibrations. In the course of constructing these calibrations, a data base containing the relevant information for the stars which have published data was produced. The rates that show empirically how important stellar winds are for an understanding of the interstellar medium are presented. Dissert. Abstr.

N84-34359*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A CRYOGENICALLY COOLED, MULTIDETECTOR SPECTROMETER FOR INFRARED ASTRONOMY
Fred C. Witteborn and Jesse D. Bregman Aug. 1984 8 p refs (NASA-TM-86004; A-9837; NAS 1.15:86004) Avail: NTIS HC A02/MF A01 CSCL 03B

A liquid helium-cooled, 24 detector grating spectrometer was developed and used for low resolution astronomical observations in the 5 to 14 micron spectral range. The instrument operated on the 91 cm Kuiper Airborne Observatory, the 3 m IRTF (Mauna Kea), the 3 m Shane telescope Observatory, the 3 m Shane telescope (Lick Observatory), and the 152 cm NASA and University of Arizona telescope. The detectors are discrete Si:Bi photoconductors with individual metal oxide semiconductor field effect transistor preamplifiers operating at 4 K. The system uses a liquid helium-cooled slit, order-sorter filter, collimator mirror, grating, and camera mirror arranged in a Czerny-Turner configuration with a cold stop added between the collimator mirror and the grating. The distances between components are chosen so that the collimator mirror images the secondary mirror of the telescope onto the cold stop, thus providing a very effective baffle. Scattered radiation is effectively reduced by using liquid helium-cooled, black baffles to divide the spectrometer into three separate compartments. The system noise-equivalent flux density, when used on the 152 cm telescope from 8 to 13 microns with a resolving power of 50, is 4.4 x 10 to the minus 17th power W/sq cm micron square root of Hz. The main applications are for measuring continuum radiation levels and solid state emission and absorption features in regions of star and planet formation. R.S.P.

N84-34360*# Clemson Univ., S.C. Dept. of Physics and Astronomy.
AGES OF EXTRAGALACTIC INTERMEDIATE-AGE STAR CLUSTERS Final Technical Report
Phillip J. Flower 1983 5 p
(Grant NAGw-441)
(NASA-CR-173927; NAS 1.26:173927) Avail: NTIS HC A02/MF A01 CSCL 03B

A dating technique for faint, distant star clusters observable in the local group of galaxies with the space telescope is discussed. Color-magnitude diagrams of Magellanic Cloud clusters are mentioned along with the metallicity of star clusters. R.S.F.

N84-34361*# University of Southern California, Los Angeles. Center for Space Sciences.
PIONEER 10 AND VOYAGER OBSERVATIONS OF THE INTERSTELLAR MEDIUM IN SCATTERED EMISSION OF THE He584 A AND H LYA 1216 A LINES
D. E. Shemansky, D. L. Judge, and J. M. Jessen [1984] 4 p refs
(Grants NAGw-163; NAGw-106)
(NASA-CR-173931; NAS 1.26:173931) Avail: NTIS HC A02/MF A01 CSCL 03B

The combination of Pioneer photometric and Voyager spectrometric observations of EUV interstellar-interplanetary emissions in the region beyond 5 A was applied to a determination of atomic hydrogen and helium densities. These density estimates obtained from direct measurement of scattered radiation depend on absolute calibration of the instruments in the same way as other earlier determinations based on the same method. However, the spacecraft data were combined with daily full sun averages of the H Lyman 1216 A line obtained by the Solar Mesospheric Explorer satellite to obtain a measure of atomic hydrogen density independent of instrument absolute calibration. The method depends on observations of long and short term temporal variability of the solar line over a one year period, and the fact that the ISM is optically thick. The density estimates from preliminary work on these observations are [H] = 0.12 cu cm and [H] = .016 cu cm, giving a density ratio close to the cosmic abundance value in contrast to some earlier results indicating a depletion of atomic hydrogen. Estimates were obtained of galactic background emissions in the signals of both spacecraft. Author

N84-34362# Space Telescope Science Inst., Baltimore, Md.
ON DETECTING DIFFUSE ULTRAVIOLET RADIATION OF COSMOLOGICAL ORIGIN
Francesco Paresce Sep. 1983 34 p refs Presented at the 1st Workshop on Galactic and Extragalactic Dark Matter, Rome, 28-30 Jun. 1983 Submitted for publication
(Preprint-10) Avail: NTIS MF A01; print copy available at WMO, Geneva

The intensity of diffuse extragalactic background radiation is determined by the integrated emission of all sources along a given line of sight through the universe and by absorption due to intervening cool gas and dust. Due to redshift and lookback-time effects, more distant objects contribute at a given wavelength today with light emitted at earlier epochs at shorter wavelengths. Possible sources of ultraviolet (100 to 3000 A) emission include, but may not be restricted to, galaxies and quasars, a lukewarm or photoionized dense intergalactic medium and a cosmological sea of decaying massive neutrinos and photinos formed in the hot big bang. The resultant complex spatial intensity pattern and spectral distribution will appear superimposed on an intense galactic emission source whose main characteristics have yet to be clearly and satisfactorily established. Although substantial progress has been made recently in understanding galactic emission mechanisms, the remaining uncertainties substantially limit the accuracy with which a cosmologically significant signal may be disentangled from the diffuse galactic background noise. Author

N84-34333*# Maryland Univ., College Park.
RECONNECTION OF MAGNETIC FIELDS
In its Solar Terrest. Phys. Jun. 1984 71 p refs (For primary document see N84-34332 23-88)
Avail: NTIS HC A25/MF A01 CSCL 03B

N84-34334*# Maryland Univ., College Park.
PARTICLE ACCELERATION
In its Solar Terrest. Phys. Jun. 1984 52 p refs (For primary document see N84-34332 23-88)
Avail: NTIS HC A25/MF A01 CSCL 03B

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights. For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

N84-34363*# National Aeronautics and Space Administration, Washington, D. C.
TRENDS IN PLANETARY DATA ANALYSIS. EXECUTIVE SUMMARY OF THE PLANETARY DATA WORKSHOP
Nancy Evans Sep. 1984 46 p Workshop held in Greenbelt, Md., 29 Nov. - 2 Dec. 1983
(NASA-CP-2333; NAS 1.55:2333) Avail: NTIS HC A03/MF A01 CSCL 03B

Planetary data include non-imaging remote sensing data, which includes spectrometric, radiometric, and polarimetric remote sensing observations. Also included are in-situ, radio/radar data, and Earth based observation. Also discussed is development of a planetary data system. A catalog to identify observations will be the initial entry point for all levels of users into the data system. There are seven distinct data support services: encyclopedia, data index, data inventory, browse, search, sample, and acquire. Data systems for planetary science users must provide access to data, process, store, and display data. Two standards will be incorporated into the planetary data system: Standard communications protocol and Standard format data unit. The data system configuration must combine a distributed system with those of a centralized system. Fiscal constraints have made prioritization important. Activities include saving previous mission data, planning/cost analysis, and publishing of proceedings. S.B.

N84-34364# Oulu Univ. (Finland). Dept. of Astronomy.
POLYPHASE TECTONICS OF THE OCEANUS PROCELLARUM AREA ON THE MOON
J. Raitala [1984] 15 p refs Presented at the 27th Intern. Geol. Congr., 4-14 Aug. 1984
Avail: NTIS HC A02/MF A01

The factors contributing most to the explanation of the polyphase tectonic development of the Oceanus Procellarum area are discussed in terms of the present lunar surface macrostructures. The initial accumulation, heating, differentiation, and formation of the lunar internal layers may hava given rise to several deformation phases. Later tectonic, volcanic and impact events have, however, made them impossible to recognize in most cases, even in the case of the Moon. Terra lineaments are linear surface features such as terra ridges, valleys and scarps. They date from the era prior to 4.0 x 10 to the 9th power years ago when extensive bombardment broke up the lunar uppermost surface. Rille graben formation took place before 3.6 x 10 to the 9th power years ago during tensional tectonics around major mare basins. The very thin (in lunar scale) mare basin crust was at last affected by compressional forces which controlled the location and orientation of mare ridges during the mare lava floodings. Author

N84-34365# Oulu Univ. (Finland). Dept. of Astronomy.
TERRA SCARPS INDICATING YOUNGEST TERRA FAULTS ON THE MOON
J. Raitala [1983] 21 p refs
Avail: NTIS HC A02/MF A01

Lunar crustal shortening apparently is not restricted to lava filled basins alone; there are some young scarp like terra ridges in places around mare areas where they often continue other tectonic structures. This crustal shortening is not of the same intensity as in the case of the lobate scarp overthrusts on Mercury. Young lunar terra ridges indicate that crustal shortening with an areal extent also took place slightly around mare basins. Thus they link tensional rille tectonics with compressional mare ridge tectonics and indicate that areal heating/bending/extension - cooling/shortening/compression possibly describe an important factor in lunar mare and near mare tectonics in addition to the volcanic extrusions. Author

N84-34366*# National Aeronautics and Space Administration, Washington, D. C.
PLANETARY DATA WORKSHOP, PART 1
Oct. 1984 143 p Workshop held in Greenbelt, Md., 29 Nov. - 1 Dec. 1983 2 Vol.
(NASA-CP-2343-Pt-1; NAS 1.55:2343-Pt-1) Avail: NTIS HC A07/MF A01 CSCL 03B

The community of planetary scientists addresses two general problems regarding planetary science data: (1) important data sets are being permanently lost; and (2) utilization is constrainted by difficulties in locating and accessing science data and supporting information necessary for its use. A means to correct the problems, provide science and functional requirements for a systematic and phased approach, and suggest technologies and standards appropriate to the solution were explored. For individual titles, see N84-34367 through N84-34375.

N84-34367*# National Aeronautics and Space Administration, Washington, D. C.
PLANETARY DATA DEFINITION
In its Planetary Data Workshop, Pt. 1 Oct. 1984 p 9-17 (For primary document see N84-34366 23-91)
Avail: NTIS HC A07/MF A01 CSCL 03B

Planetary data include all of those data which have resulted from measurements made by the instruments carried aboard planetary exploration spacecraft, and (for our purposes) exclude observations of Moon and Earth. The working, planetary data base is envisioned to contain not only these data, but also a wide range of supporting measurements such as calibration files, navigation parameters, spacecraft engineering states, and the various Earth-based and laboratory measurements which provide the planetary research scientist with historical and comparative data. No convention exists across the disciplines of the planetary community for defining or naming the various levels through which data pass in the progression from a sensed impulse at the spacecraft to a reduced, calibrated, and/or analyzed element in a planetary data set. Terms such as EDR (experiment data record), RDR (reduced data record), and SEDR (supplementary experiment data record) imply different meanings depending on the data set under consideration. The development of standard terminology for the general levels of planetary data is necessary. Author

N84-34368*# National Aeronautics and Space Administration, Washington, D. C.
USER REQUIREMENTS
In its Planetary Data Workshop, Pt. 1 Oct. 1984 p 18-26 (For primary document see N84-34366 23-91)
Avail: NTIS HC A07/MF A01 CSCL 03B

The capabilities, enumerated during the Planetary Data Workshop, which the ideal Planetary Data System (PDS) should provide to its users are summarized. System design and implementation activities must take into account that all requirements do not carry the same weight. While some system requirements are essential and must be met early, other requirements are of a less immediate nature and can be implemented during later stages of development. Some requirements may be determined to be not essential to the operation of a PDS or impractical, and then not considered for implementation. It is assumed, that the PDS implementation will be modular in architecture and accomplishment. The modular plan is supported by many potential benefits in that it: simplifies the design and planning activities; improves the ability to respond to the changing demands of the user community; permits incorporation of emerging technologies; and allows the implementation to remain flexible in the face of fluctuating resources. B.G.

N84-34369*# National Aeronautics and Space Administration, Washington, D. C.
CONFIGURATION AND IMPLEMENTATION
In its Planetary Data Workshop, Pt. 1 Oct. 1984 p 27-41 (For primary document see N84-34366 23-91)
Avail: NTIS HC A07/MF A01 CSCL 03B

The main objectives of a Planetary Data System (PDS) are to curate planetary data - that is to store and maintain complete planetary data sets and the necessary supporting documentation to make them useful - and to facilitate scientific study of these data through improved organization and access. A hardware system, no matter how sophisticated and supportive, cannot replace the live colleague interaction needed for good science. System users with only a general knowledge of a data file or data set will need guidance in determining whether that data is most appropriate to support a theory. The PDS is meant to allow easy access to data, to provide useful presentations of that data, and to facilitate data analysis; however it is not designed to supersede the critical examination and interactions that data analysis requires. The Planetary Data System will be a powerful research tool which allows the entire planetary science community access to a complete data and will facilitate the archiving of pass, current, and future mission data sets. Author

N84-34370*# National Aeronautics and Space Administration, Washington, D. C.
IMAGING DATA
In its Planetary Data Workshop, Pt. 1 Oct. 1984 p 42-71 (For primary document see N84-34366 23-91)
Avail: NTIS HC A07/MF A01 CSCL 03B

The primary, planetary imaging data base includes all images obtained in visible wavelengths by imaging camera systems aboard planetary spacecraft. (Excluded, due to the volume and complexity of the data, are images taken from Lunar or Earth orbital spacecraft). These estimated 145,000 individual images exist on 12,400 magnetic tapes in a digital format primarily as Experiment Data Records (EDRs); and most are accompanied by the Supplementary Experiment Data Records (SEDRs), which render the EDRs useful. Hardcopy pictures and negatives, the designated archive products for imaging experiments, along with color products and mosaics are maintained at the National space Science Data Center (NSSDC). Also included in the discussion of imaging data are two-dimensional data produced by spacecraft instruments other than optical sensors which may be considered images in a broad sense. Examples of these instruments are imaging radar systems, scanning infrared radiometers, and photopolarimeters. Author

N84-34371*# National Aeronautics and Space Administration, Washington, D. C.
NON-IMAGING REMOTE SENSING DATA
In its Planetary Data Workshop, Pt. 1 Oct. 1984 p 72-85 (For primary document see N84-34366 23-91)
Avail: NTIS HC A07/MF A01 CSCL 03B

Spectrometric, radiometric and polarimetric remote sensing observations of wavelengths from gamma-rays to microwaves are addressed. The basic form of the data is one dimensional arrays. At the high energy end of the spectrum, data are typically presented as pulse count versus energy, and at lower energies, as intensity versus wavelength. High spectral resolution measurements (better 1% of wavelength) are particularly useful for identifying atomic, molecular, and ionic species while broader band measurements are adequate for identifying minerals and for determining total energy fluxes. Polarization data permit the study of finely divided material such as clouds and surfaces. Author

N84-34372*# National Aeronautics and Space Administration, Washington, D. C.
IN SITU DATA
In its Planetary Data Workshop, Pt. 1 Oct. 1984 p 86-90 (For primary document see N84-34366 23-91)
Avail: NTIS HC A07/MF A01 CSCL 03B

In-situ planetary data include all measurements made by a wide variety of instruments whose sensors are exposed directly to the planetry environment. Typical measurements include those of magnetic fields, energetic particle densities and energy distributions, plasma wave characteristics, ionospheric and neutral gas densities, temperatures, composition and motions. A large body of scientists in the United States, and the world, are involved in research using in-situ data. Many of these scientists are associated with Mission investigations groups which provide specific types of in-situ data. These groups, in the course of data analysis, use data provided by similar groups. The interdisciplinary nature of these investigations fosters exchange and reliance upon one another for data is heavy. To a lesser extent, correlative data sets are obtained from the National Space Science Data Center (NSSDC). However, the data entries often have limited temporal and spatial resolution, are of uncertain quality, and are usually available only for measurements that are several years old. Author

N84-34373*# National Aeronautics and Space Administration, Washington, D. C.
RADIO SCIENCE
In its Planetary Data Workshop, Pt. 1 Oct. 1984 p 91-106 (For primary document see N84-34366 23-91)
Avail: NTIS HC A07/MF A01 CSCL 03B

Radio science experiments use electromagnetic waves to probe or study the solar system. Three major research areas were identified within this discipline: radio astronomy, radar astronomy, and celestial mechanics. Radio astronomy (or radiometry) is the detection and measurement of naturally produced radio frequency emissions. Sources include surfaces, atmospheres, rings, and plasmas. Radar astronomy is the observation of man-made signals after their interaction with a target. Both imaging and non-imaging results. Celestial mechanics includes all studies related to the motions of (and gravity fields of) bodies within the solar system. These should not be considered rigid separations, but aid in the discussion of the data sets. B.G.

N84-34374*# National Aeronautics and Space Administration, Washington, D. C.
EARTH-BASED PLANETARY DATA
In its Planetary Data Workshop, Pt. 1 Oct. 1984 p 107-119 (For primary document see N84-34366 23-91)
Avail: NTIS HC A07/MF A01 CSCL 03B

NASA sponsors Earth-based planetary astronomy to provide data needed for: planning future missions; supporting missions already in progress; and enhanching the scientific analysis of data returned by past missions. Such data complement spacecraft data by providing observational coverage of important planetary phenomena at epochs before and after spacecraft encounters, with time scales longer than a spacecraft encounter, and at wavelengths and spectral resolutions not covered by spacecraft instruments. Earth-based planetary data are defined here as: observations made with ground based telescopes, balloon-borne instruments, rocket-borne instruments, and Earth-orbiting spacecraft. Data in the last category differ somewhat in nature and availability from the other three. In all categories, planetary data are only a subset of the total astronomical observations on record. As a result part of the task is to identify and extract (or separately catalog) those observations which are planetary. The data cover wavelengths in the ultraviolet, the visual, and the infrared. The instrumental techniques addressed are: imaging, polarimetry, photometry, spectrophotometry, and spectroscopy. B.G.

N84-34375*# National Aeronautics and Space Administration, Washington, D. C.
LABORATORY
In its Planetary Data Workshop, Pt. 1 Oct. 1984 p 120-130 (For primary document see N84-34366 23-91)
Avail: NTIS HC A07/MF A01 CSCL 03B

Definition of laboratory data; sources of data and data volume, required support documentation for lab data; urgency of building a computerized archieve; software needed for management of lab data; analysis of data; and location and access to the data archive are discussed. B.G.

N84-34376*# National Aeronautics and Space Administration, Washington, D. C.
PLANETARY DATA WORKSHOP, PART 2
Oct. 1984 133 p Workshop held in Greenbelt, Md., 29 Nov. - 1 Dec. 1983 2 Vol.
(NASA-CP-2343-Pt-2; NAS 1.55:2343-Pt-2) Avail: NTIS HC A07/MF A01 CSCL 03B

Technical aspects of the Planetary Data System (PDS) are addressed. Methods and tools for maintaining and accessing large, complex sets of data are discussed. The specific software and applications needed for processing imaging and non-imaging science data are reviewed. The need for specific software that provides users with information on the location and geometry of scientific observations is discussed. Computer networks and user interface to the PDS are covered along with Computer hardware available to this data system. For individual titles, see N84-34377 through N84-34382.

N84-34377*# National Aeronautics and Space Administration, Washington, D. C.
DATABASE MANAGEMENT
In its Planetary Data Workshop, Pt. 2 Oct. 1984 p 148-166 (For primary document see N84-34376 23-91)
Avail: NTIS HC A07/MF A01 CSCL 03B

Management of the data within a planetary data system (PDS) is addressed. Principles of modern data management are described and several large NASA scientific data base systems are examined. Data management in PDS is outlined and the major data management issues are introduced. R.S.F.

N84-34378*# National Aeronautics and Space Administration, Washington, D. C.
SOFT-1: IMAGING PROCESSING SOFTWARE
In its Planetary Data Workshop, Pt. 2 Oct. 1984 p 167-172 (For primary document see N84-34376 23-91)
Avail: NTIS HC A07/MF A01 CSCL 03B

Five levels of image processing software are enumerated and discussed: (1) logging and formatting; (2) radiometric correction; (3) correction for geometric camera distortion; (4) geometric/navigational corrections; and (5) general software tools. Specific concerns about access to and analysis of digital imaging data within the Planetary Data System are listed. R.S.F.

N84-34379*# National Aeronautics and Space Administration, Washington, D. C.
NON-IMAGING SOFTWARE/DATA ANALYSIS REQUIREMENTS
In its Planetary Data Workshop, Pt. 2 Oct. 1984 p 173-184 (For primary document see N84-34376 23-91)
Avail: NTIS HC A07/MF A01 CSCL 03B

The analysis software needs of the non-imaging planetary data user are discussed. Assumptions as to the nature of the planetary science data centers where the data are physically stored are advanced, the scope of the non-imaging data is outlined, and facilities that users are likely to need to define and access data are identified. Data manipulation and analysis needs and display graphics are discussed. R.S.F.

N84-34380*# National Aeronautics and Space Administration, Washington, D. C.
GEOMETRY SOFTWARE COMMON TO ALL EXPERIMENTS
In its Planetary Data Workshop, Pt. 2 Oct. 1984 p 185-188 (For primary document see N84-34376 23-91)
Avail: NTIS HC A07/MF A01 CSCL 03B

All imaging, remote sensing, and in situ experiments require information about the geometry and location of observations. An alterntive to collecting geometry data with a supplementary experiment data record is proposed. The new method involves identifying the fundamental information, that is, the geometric state upon which geometry calculations are based, and maintaining or delivering these calculations in separate packages which are easily replaced when improved information is available. Implementation of this method in spacecraft navigation is discussed along with software system requirements. R.S.F.

N84-34381*# National Aeronautics and Space Administration, Washington, D. C.
NETWORKING
In its Planetary Data Workshop, Pt. 2 Oct. 1984 p 189-214 (For primary document see N84-34376 23-91)
Avail: NTIS HC A07/MF A01 CSCL 03B

Data exchange and communication between users, between nodes, and between users and nodes within the Planetary Data System are discussed. Data transport costs, methods, and protocol are reviewed. R.S.F.

N84-34382*# National Aeronautics and Space Administration, Washington, D. C.
PLANETARY SCIENCE ANALYSIS SUPPORT SYSTEM: HARDWARE REPORT
In its Planetary Data Workshop, Pt. 2 Oct. 1984 p 215-223 (For primary document see N84-34376 23-91)
Avail: NTIS HC A07/MF A01 CSCL 03B

The computeer hardware requirements for a planetary science data analysis support system are described. Present practice, state-of-the-art, and predictable developments are considered. Specific recommendations are presented for those who plan to acquire new computational tools, those who must install and use them, and those who pay for them. Author

N84-34383*# University of Southern California, Los Angeles.
PARTICLE EXCITATION, AIRGLOW AND H2 VIBRATIONAL DISEQUILIBRIUM IN THE ATMOSPHERE OF JUPITER Final Technical Report
D. E. Shemansky 26 Sep. 1984 11 p
(Grant NAGw-316)
(NASA-CR-173930; NAS 1.26:173930) Avail: NTIS HC A02/MF A01 CSCL 03B

The extreme ultraviolet EUV emission produced by particle excitation of the hydrogen atmospheres of Jupiter and Saturn is examined using model calculations to determine the nature of the energy deposition process and the effect of such processes on atmospheric structure. Tasks ranging from examination of phenomenologically related processes on Saturn and Titan to analysis of experimental laboratory data required to allow accurate modeling of emissions from hydrogenic atmospheres are investigated. An explanation of the hydrogen H Ly(alpha) bulge in Jupiter's emission from the equatorial region is presented. It is propcsed that Saturn, rather then Titan is the major source of the extended hydrogen cloud. The atomic hydrogen detected at the rings of Saturn may originate predominantly from the same source. A cross calibration is obtained between the Pioneer 10 EUV photometer and the Voyager EUV spectrometers, thus providing a direct measure of the temporal morphology of Jupiter between a minimum and a maximum in solar activity. Atomic and molecular data required for the research program are analyzed. An extrapolation of conditions in the upper atmospheres of Jupiter and Saturn produces a predicted condition at Uranus in terms of excitation and hydrogen escape rates that may be observed at Voyager-Uranus encounter. M.A.C.

N84-34384*# Rutgers Univ., New Brunswick, N. J. Dept. of Geological Sciences.
METAL-SILICATE RELATIONSHIPS IN DIFFERENTIATED METEORITES Final Technical Report, 1977 - 1983
Roger H. Hewins 1983 7 p
(Grant NsG-7327)
(NASA-CR-173929; NAS 1.26:173929) Avail: NTIS HC A02/MF A01 CSCL 03B

A wide range of analytical and experimental techniques were used to determine the nature and origin of meteoritc materials, and its significance in the early history of the solar system. The results on four major topics are summarized: howardites, mesosiderites, diogenites, and chrondules. Author

N84-34385*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
VIKING RADIO SCIENCE DATA ANALYSIS AND SYNTHESIS

Semiannual Status Report, 30 Dec. 1983 - 30 Jun. 1984
Irwin I. Shapiro Sep. 1984 13 p refs
(Grant NAGw-411)
(NASA-CR-173966; NAS 1.26:173966; SASR-3) Avail: NTIS HC A02/MF A01 CSCL 03B

The rotational motion of Mars and its geophysical ramifications were investigated. Solar system dynamics and the laws of gravitation were also studied. The planetary ephemeris program, which was the central element in data analysis for this project, is described in brief. Viking Lander data were used in the investigation. R.S.F.

N84-34386*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A MODELING ANALYSIS PROGRAM FOR THE JPL TABLE MOUNTAIN IO SODIUM CLOUD DATA Interim Report, 1 Jun. - 31 Aug. 1984
William H. Smyth (Atmospheric and Environmental Research, Inc.) and Bruch A. Goldberg Sep. 1984 11 p refs
(Contract NASw-3949)
(NASA-CR-173971; NAS 1.26:173971) Avail: NTIS HC A02/MF A01 CSCL 03B

The abundant Io sodium cloud data obtained at JPL Table Mountain was reviewed. Images of the sodium cloud important to this modeling analysis program are contained in the 1976-1979 data set and the 1981 data set. A preliminary assessment of the 263 images in the 1981 data set for Region B/C was initiated. The spatial morphology of some of these images revealed the presence of the forward sodium cloud (Region B) and the directional features (Region C) as expected. Plans for the second quarter to initiate preliminary modeling analysis and to define further data processing are discussed. A.R.H.

N84-34387*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif. Electronics Research Lab.
SATURN'S RINGS: 3-mm LOW-INCLINATION OBSERVATIONS AND DERIVED PROPERTIES
E. E. Epstein (Aerospace Corp., El Segundo, Calif.), M. A. Janssen (JPL), and J. N. Cuzzi 15 Jun. 1984 28 p
(NASA-TM-87363; NAS 1.15:87363; AD-A143841; TR-0084(4925-06); SD-84-23) Avail: NTIS HC A03/MF A01 CSCL 03B

We have combined 3-mm observations of Saturn at low ring inclinations with our previous observations to determine a much more precise brightness temperature for Saturn's rings. Allowing for uncertainties in the optical depth and uniformity of the A and B rings and for ambiguities due to the C ring, but assuming the ring brightness to remain approximately constant with inclination, we determine a mean brightness temperature for the A and B rings of 17 + or - 4 K. The portion of this brightness attributed to ring particle thermal emission is 11 + or - 5 K. The disk temperature of Saturn without the rings would be 156 + or - 6 K, relative to absolutely calibrated disk temperature for Jupiter. Assuming that the ring particles are pure water ice, a simple slab emission model leads to an estimate of typical particle sizes of approx 0.3 m. A multiple scattering model gives a ring particle effective isotropic single-scattering albedo of 0.85 + or - 0.05. This albedo has been compared with theoretical Mie calculations of average albedo for various combinations of particle size distribution and refractive indices. If the maximum particle radius (approx 5 m) deduced from Voyager bistatic radar observations (Marouf, et al., 1982) is correct, our results indicate either (1) a particle distribution between 1 cm and several meters radius of the form r-s with 3.3 < or approx s < or approx 3.6, or (2) a material absorption coefficient between 3 and 10 times lower than that of pure water ice Ih at 85 K, or both. GRA

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N84-34388*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ON LONG-TERM PERIODICITIES IN THE SUNSPOT RECORD
Robert M. Wilson Jul. 1984 50 p refs
(NASA-TM-86458; NAS 1.15:86458) Avail: NTIS HC A03/MF A01 CSCL 03B

Sunspot records are systematically maintained, with the knowledge that an 11 year average period exists since about 1850. Thus, the sunspot record of highest quality and considered to be the most reliable is that of cycle eight through the present. On the basis of cycles 8 through 20, various combinations of sine curves were used to approximate the observed R sub MAX values (where R sub MAX is the smoothed sunspot number at cycle maximum). It is found that a three component sinusoidal function, having an 11 cycle and a 2 cycle variation on a 90 cycle periodicity, yields computed R sub MAX values which fit, reasonably well, observed R sub MAX values for the modern sunspot cycles. Extrapolation of the empirical functions forward in time allows for the projection of values of R sub MAX for cycles 21 and 22. For cycle 21, the function projects a value of 157.3, very close to the actually observed value of 164.5. For cycle 22, the function projects a value of about 107. Linear regressions applied to cycle 22 indicate a long-period cycle (cycle duration > 132 months). An extensive bibliography on techniques used to estimate the time dependent behavior of sunspot cycles is provided. R.S.F.

N84-34389# Berkeley Research Association, Calif.
RESEARCH STUDIES ON MAGNETOHYDRODYNAMIC SYSTEMS AND MODELING SOLAR DYNAMICAL BEHAVIOR Final Report, Jul. 1981 - Jun. 1983
Nov. 1983 135 p Prepared for NRL, Washington, D.C. Original contains color illustrations
(Contract N00014-81-C-2444)
(AD-A143680; AD-E001644; PD-BRA-83-307R) Avail: NTIS HC A07/MF A01 CSCL 03/2

Research involving magnetohydrodynamic systems and solar dynamical behavior is presented. The reported research is divided into seven major sections: Section 1. Laser Beam Matter Interactions, Section 2. Ion Beam Matter Interactions, Section 3. Energy Loss of Fast Particles to an Electron Plasma, Section 4. Solar Magnetic Flux Transport, Section 5. Solar Magnetic Flux Emergence, Section 6. Coronal Bullets and Section 7. Solar Flares and Preflare Studies. GRA

N84-34335*# Maryland Univ., College Park.
EVOLUTION OF SOLAR MAGNETIC FLUX
In its Solar Terrest. Phys. Jun. 1984 32 p refs (For primary document see N84-34332 23-88)
Avail: NTIS HC A25/MF A01 CSCL 03B

N84-34336*# Maryland Univ., College Park.
MHD WAVES AND TURBULENCE IN THE SUN AND INTERPLANETARY MEDIUM
In its Solar Terrest. Phys. Jun. 1984 19 p refs (For primary document see N84-34332 23-88)
Avail: NTIS HC A25/MF A01 CSCL 03B

N84-34337*# Maryland Univ., College Park.
COUPLING OF THE SOLAR WIND TO THE MAGNETOSPHERE
In its Solar Terrest. Phys. Jun. 1984 23 p refs (For primary document see N84-34332 23-88)
Avail: NTIS HC A25/MF A01 CSCL 03B

N84-34338*# Maryland Univ., College Park.
CORONAL TRANSIENTS AND THEIR INTERPLANETARY EFFECTS
In its Solar Terrest. Phys. Jun. 1984 30 p refs (For primary

document see N84-34332 23-88)
Avail: NTIS HC A25/MF A01 CSCL 03B

N84-34341*# Maryland Univ., College Park.
IMPACT OF FLARES ON THE SOLAR TERRESTRIAL ENVIRONMENT
In its Solar Terrest. Phys. Jun. 1984 38 p refs (For primary document see N84-34332 23-88)
Avail: NTIS HC A25/MF A01 CSCL 03B

93 SPACE RADIATION

Includes cosmic radiation; and inner and outer Earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N84-34390 Texas Univ., Austin.
LOW RADIO FREQUENCY EXTRAGALACTIC VARIABLE SOURCES Ph.D. Thesis
David Bruce Garrett 1983 147 p
Avail: Univ. Microfilms Order No. DA8414373

The results of previous investigations aimed at detecting low radio frequency variability in extragalactic sources are examined to characterize the phenomenon and to compile a list of 64 known variables based on the criterion that there is at most a 0.1% chance that the observed fluctuations are due to random noise. The variability behavior of an additional 35 sources found during a survey conducted by the University of Texas Radio Astronomy Observatory (UTRAO) is analyzed. First the error estimates of the observable quantities are examined to make certain that the errors are not underestimated and so insure the validity of claims for variability. Sources suspected of varibility were observed at two frequencies at the VLA to obtain structures and spectral indices. This allows better models to be used in the reduction of UTRAO interferometer data to find flux density estimates at four epochs. The VLA information also allows the separation of the sources into those with steep spectral indices and those with flat spectral indices. Dissert. Abstr.

N84-34391*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MHD PROCESSES IN THE OUTER HELIOSPHERE
L. F. Burlaga Aug. 1984 117 p refs
(NASA-TM-86137; NAS 1.15:86137) Avail: NTIS HC A06/MF A01 CSCL 03B

The magnetic field measurements from Voyager and the magnetohydrodynamic (MHD) processes in the outer heliosphere are reviewed. A bibliography of the experimental and theoretical work concerning magnetic fields and plasmas observed in the outer heliosphere is given. Emphasis in this review is on basic concepts and dynamical processes involving the magnetic field. The theory that serves to explain and unify the interplanetary magnetic field and plasma observations is magnetohydrodynamics. Basic physical processes and observations that relate directly to solutions of the MHD equations are emphasized, but obtaining solutions of this complex system of equations involves various assumptions and approximations. The spatial and temporal complexity of the outer heliosphere and some approaches for dealing with this complexity are discussed. R.S.F.

N84-34392*# California Inst. of Tech., Pasadena. Space Radiation Lab.
RESEARCH IN PARTICLES AND FIELDS Semiannual Status Report, 1 Apr. 1983 - 31 Mar. 1984
E. C. Stone, A. Buffington, L. Davis, Jr., T. A. Prince, and R. E. Vogt 1984 41 p refs
(Grant NGR-05-002-160)
(NASA-CR-173928; NAS 1.26:173928) Avail: NTIS HC A03/MF A01 CSCL 03B

Research activities in cosmic rays, gamma rays, and astrophysical plasmas are reviewed. Energetic particle and photon detector systems flown on spacecraft and balloons were used to carry out the investigations. Specific instruments mentioned are: the high energy isotope spectrometer telescope, the electron/isotope spectrometer, the heavy isotope spectrometer telescope, and magnetometers. Solar flares, planetary magnetospheres, element abundance, the isotopic composition of low energy cosmic rays, and heavy nuclei are among the topics receiving research attention. R.S.F.

N84-34342*# Maryland Univ., College Park.
COLLISIONLESS SHOCK WAVES IN THE SOLAR TERRESTRIAL ENVIRONMENT
In its Solar Terrest. Phys. Jun. 1984 58 p refs (For primary document see N84-34332 23-88)
Avail: NTIS HC A25/MF A01 CSCL 03B

99 GENERAL

N84-34393# Technische Physische Dienst TNO-TH, Delft (Netherlands).
ACTIVITIES OF THE TECHNICAL PHYSICS SERVICE OF THE DUTCH CENTRAL ORGANIZATION FOR SCIENTIFIC RESEARCH, PAST AND PRESENT
1981 81 p In DUTCH
Avail: NTIS HC A05/MF A01

Changes in management and in focus of the activities are reported. Noise abatement in buildings and elsewhere, traffic noise, and noise pathways in ships were studied. In water-related research, the thickness of the sand layers was measured for the storm water dike in the Oosterschelde. Energy-related research concentrated on conservation, determination of the insulation quality of dwellings, and testing of the effect of solar energy systems and solar energy storage. The possibility of using magnetic inspection for inservice inspection of pipes in nuclear power plants was studied. Among other systems and devices, the laser Doppler speed gauge was improved. A gas detector, hybrid amplifier, acoustic meters for hydraulic conditions, wave direction determination devices, network measurement instruments, and space flight instruments were also investigated. Transl. by A.R.H.

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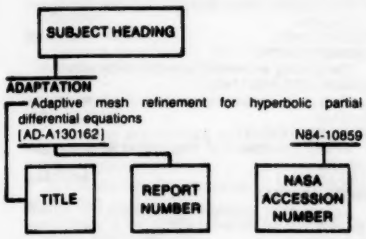

The subject heading is the key to the subject content of the document. Titles, report numbers, and accession numbers of pertinent documents are provided under each subject heading. When the title is insufficiently descriptive of the document content, a title extension has been added, separated from the title by three hyphens. The report number helps to indicate the type of document cited (e.g., NASA report, NASA translation, NASA contractor report). The NASA accession number is the number by which the document abstracts are arranged in this journal and by which the document is sold or requested. The titles, with title extensions if present, are arranged under each subject heading in ascending accession number order. The subject headings have been selected from the latest revision of the *NASA Thesaurus* (NASA SP-7051).

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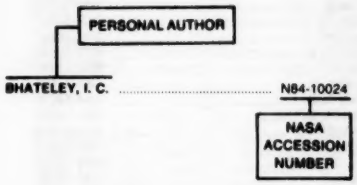

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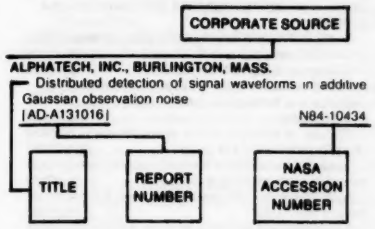

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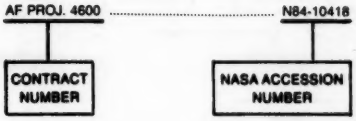

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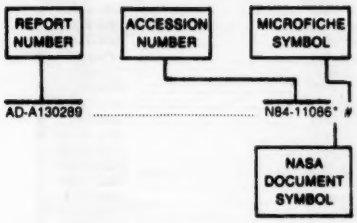

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